

DISCOVERY

A MONTHLY POPULAR JOURNAL OF KNOWLEDGE

EDITED BY EDWARD LIVEING, B.A.

SCIENTIFIC ADVISER: A. S. RUSSELL, D.Sc.

Trustees:—SIR J. J. THOMSON, O.M., F.R.S.
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Vol. II, No. 24, DECEMBER 1921

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DE HAVILLAND MONOPLANE

Showing absence of bracing wires owing to cantilever construction.

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Editorial Notes

DURING the last few weeks public interest has in various ways been directed to questions concerning the development of national and international communications. A prophetic speech, mostly relating to air communications, was delivered by our Director of Civil Aviation, Major-General Sir Frederick Sykes, at the annual dinner of the Institute of Transport on October 10; Lord Curzon gave expression during the last Parliamentary session to what we believe is a steadily growing popular wish—the desire for the Channel railway tunnel; the Richborough Ferry, first employed for war purposes, has recently been found of great use in the transport of fruit trains, coming from the south of France, across the Channel; the French Press, prompted by the present state of affairs in Morocco, has been discussing the possibilities of a railway tunnel under the Straits of Gibraltar, for which a not too ambitious scheme providing for a single tube 18 feet in diameter has been drawn up by the well-known Spanish engineer, Señor Rubio y Bellue; as to ventures less far afield and of more local importance, the London Traffic Combine has submitted a scheme to the Government for extending the London underground railways in connection with the Government's proposal of guaranteeing the interest on capital issues to be used for undertakings likely to provide work for the unemployed.

Objections raised against launching out on new projects of this kind at a time when the whole of Europe and even America is struggling in the grip of a financial *chimera* seem plausible enough at first sight. But very strong arguments exist against such objections. It is, for instance, questionable whether we can afford in the long run to stay the material progress of our civilisation. As Sir Frederick Sykes said in the speech which we have mentioned, "The evolution of our civilisation is largely a history of endeavour to extend the limits imposed upon human living and mobility in each of the great phases through which it has passed." He also remarked that "foresight of a few years is not too much to ask when it is a question of the advance or decline of our Empire, and yet nobody seems to have time to think more than a week ahead." We hold no particular brief for international competition; we would rather see international co-operation in such matters, though naturally we desire our Empire to take a prominent part in such co-operation. The last few years have taught us two lessons—that nations are to an enormous extent dependent for existence one upon another, and that for this reason the development of communications between them is essential. If the machinery of our civilisation is creaking at present, the best way to rectify the evil is to increase the plant and so alleviate the stress on the existing mechanism.

* * * * *

Another and more immediate argument for hastening into actuality recent discoveries and developments in air and land transport is that this would provide work for thousands of our unemployed. The Government has proposed backing commercial enterprises with credit to the extent of £26,000,000. It was made clear in an article in last month's *DISCOVERY*¹ that such action can only be in the nature of a palliative. Palliatives have, however, become a necessity, as Professor Knoop indicated, and palliatives that can be applied to such sound uses will prove most valuable. It is obvious that the development of aerial highways throughout our own Empire will in the long run be attended by the most far-reaching results of any means of communica-

¹ *The Problem of Unemployment*, by Professor Douglas Knoop, p. 286.

tion, but the Government is already heavily subsidising goods and passenger traffic by air, and we are inclined to think that the newly proposed credit would be more valuably devoted to railway extensions. The schemes submitted by the London Traffic Combine for the extension of our capital's underground railways should prove a great benefit when put into operation, but, as we have noted, they are of almost entirely local importance. The electrification of our railways, plans for which were proposed by Sir Eric Geddes some time ago, would serve eventually as a fillip to our home trade. Yet it seems to us that the linking-up of our railways, by a Channel tunnel, with those of the Continent would have a far greater effect upon our national prosperity than any other single scheme, vastly promoting, as it would, our import and export trades.

* * * * *

For such a project we have the men, the material, and, we hope, a willingness on the part of the Government to back it with a portion of the proposed credit for commercial enterprises. Is any capitalist or any body of capitalists willing to come forward with the money? The time is not by any means inopportune to urge once more that at least a start might be made with the project. The objections are that the risk is great and that no return upon such an investment is possible under at least ten years. Engineers, however, have told us that the project is a practicable one, and it is certain that the eventual financial return would be enormous. The idea that the tunnel would destroy Great Britain's position as an island and render her more liable to attack during war is now surely negligible. We are already part of Europe, and in the next great war the menace, for example, of air attacks will a thousand times outweigh that of one through a couple of tubes no wider than the funnels of a big liner and capable of being blocked with the greatest ease, especially if the suggestion formerly in favour were adopted, of exposing a stretch of the approach to the tunnel to naval fire by putting the line on the front of the cliffs.

* * * * *

One is naturally tempted to consider the more distant possibilities brought within our reach by twenty-five miles or so of tubing. London, for instance, would be placed in direct railway communication with far eastern Europe, with Bukarest, Constantinople, and Athens, not to mention all the capitals of Western Europe. During the war the Germans, by cutting through the Taurus mountains in Asia Minor, connected Constantinople by railway with Aleppo and Nisibin, while the British connected Cairo with Jaffa and Jerusalem, and in Mesopotamia built a line from Basra to Tekrit. With some readjustment of the lines in Palestine and southern Syria, the laying out of some

two hundred miles of permanent way to connect Tekrit and Nisibin on the northern frontier of Mesopotamia, and a settlement of the present Græco-Turkish war, Constantinople could be put into railway communication with Cairo, and with Baghdad and Basra. Despite conflicting interests, we expect that all these things will have been done by the time the Channel tunnel is finished, and we shall be able to travel by train from London to Cairo and Baghdad. It is just possible, too, that within the next ten years the Cape to Cairo line may take material shape, though it has to be laid through very formidable natural obstacles; while an alternative route from London to the Cape would be opened up by the Gibraltar tunnel scheme, and the extension of the railways along the northern coasts of Africa.

But it will be said these are merely romantic speculations. The great value of the tunnel would lie in the elimination of loading and unloading at Channel ports, and the immense resultant speeding up of freight between London or the manufacturing towns of this country and the capitals and manufacturing towns of Europe.

* * * * *

We are glad to see that someone¹ has at last expressed a reasonable attitude towards Psycho-analysis. Thanks largely to its successful application to shell-shock cases, it took the public by storm towards the end of the war and thereafter, though it had been widely practised and discussed in central and southern Europe for ten years before the war. Other reasons for its popularity were that it was an easy science for the layman to understand, and the charlatan to exploit, it explained one's individual foibles in a pleasant way, and it allowed a more open discussion of sexual questions than had hitherto been considered "proper." Of course the Press took it up with gusto, and by making *copy* out of the extremists' theories did great harm to the reputation of the science. A reaction, largely developed in the correspondence columns of the daily Press, set in, and abuse was hurled at the whole school of our psychoanalysts by sceptical doctors and other persons who had been led to believe that the new science consisted of the frankly sexual and materialistic interpretations of Freud's more extreme followers, and that in the hands of charlatans it was undermining our national morality.

* * * * *

It is true, as the editor of *Psyche* admits, that "some of Freud's followers, as is the custom of disciples, have carried certain of his views further and have stated them more dogmatically than he himself would care to do, and there can be little doubt that he himself has unnecessarily alienated the sympathy of many students

¹ The editor of *Psyche* in the Editorial of the October number.

by his occasionally unfortunate use of words, notably the term Sexuality, which he has used to include all kinds of things which are only very remotely connected with sex as commonly understood." It is true also that the patiently worked out results of experienced practitioners were and are being exploited by charlatans. What, however, may well be emphasised is the fact that psycho-analysis, in the hands of the more moderate schools of Jung and Adler, is being developed into a science of inestimable value to mankind, that these schools should not be confused with the extreme Freudians, and that specially qualified practitioners in psycho-analysis should not be condemned together with charlatans.

* * * * *

On these points we are thoroughly in agreement with the editor of *Psyche*. But we are not quite so sure if we agree with him in his suggestions as to persons qualified to undertake psycho-analysis. He questions the necessity of demanding a full medical qualification from psycho-analysts, and sees no harm in the idea that cases should be referred (after diagnosis) by doctors to men "qualified in all the matters truly relevant to the application of the treatment." It seems to us, however, that these "matters" must include a thorough and examined knowledge in zoology, physiology, biochemistry, biology, psychology, and anthropology—practically a full medical course, and something besides. The work of a psycho-analyst cannot be placed in the same position as that of a *masseur*. By reason of his task he must be a highly intellectualised man. We are inclined to think that for the present it is the best course to leave the practice of psycho-analysis in the hands of medically-qualified specialists. The new science will automatically attract to it the more imaginative, sympathetic, and penetrating minds amongst the medical profession.

* * * * *

We cannot conclude these notes without a reference to one of the greatest precursors of psycho-analysis, the Russian novelist Dostoevsky, the centenary of whose birth has recently taken place. Though oppressed by epilepsy throughout his life of sixty years, he produced a great number of first-rate novels, including such well-known classics as *The Idiot* and *Crime and Punishment*.¹ In these he plumbed the very depths of the human soul, and showed the divine fire that can smoulder to life in the most broken and dissolute characters. His works will always afford a treasure-house to the psychologist, for to his knowledge of morbid psychology he added an ability to penetrate the characters of everyday men and women.

¹ Translations of both these novels, as well as of various other works by him, are published in the *Everyman's Library* (J. M. Dent & Sons, Ltd., 2s. 6d. each).

CONTRIBUTORS TO THIS NUMBER

"RAFEX," whose identity we are requested not to divulge, is a well-known "air" expert and an authoritative writer on aeronautics.

MR. C. S. S. HIGHAM, sometime Scholar of Trinity College, Cambridge, was awarded the Prince Consort Prize for Historical Research by Cambridge University last year. He was recently appointed Lecturer in Colonial History at Manchester University. He is the author of *The Development of the Leeward Islands under the Restoration, 1660-1688*, and *A Guide to the Colonial Records in the Public Record Office before 1696*.

THE REV. WALTER WESTON wrote on *Rural Japan* in the September number of DISCOVERY. He spent many years in Japan, first as the British Chaplain at Kobe, later as the almoner of the funds of the European Community in the Far East for the relief of the great famine in Northern Japan in 1903-4, and finally as British Chaplain at Yokohama, which appointment he occupied till 1915. A taste for mountaineering took him on long expeditions into the Japanese Alps and enabled him to obtain an unrivalled knowledge, for a European, of the life of the peasants. He is a member of the Committee of the Alpine Club and of the Council of the Japan Society.

DR. E. W. SHANAHAN was brought up on a farm in New Zealand, and has a practical as well as a theoretical knowledge of agriculture. He came to England ten years ago, after graduating at the University of New Zealand, obtained his D.Sc. in Economics at London University, was recently awarded the Hutchinson Research Medal by the London School of Economics, and is the author of *The Production and Consumption of Animal Food-stuffs with a Special Reference to the British Empire*.

DR. MARIETTE SOMAN gained high distinctions in her studies of Mediaeval and Modern Languages at Cambridge and the Sorbonne. During the war she worked in the Secret Intelligence Department of the Admiralty, and after the Armistice attended the Paris Peace Conference as Secretary in the Naval Section.

CORRECTION

We regret that in the *Books Recommended* at the end of the article on "Suggestion and Autosuggestion" in our last issue, the publishers of the English translation of Baudouin's *Suggestion et Autosuggestion* were incorrectly described. The actual publishers are George Allen & Unwin, Ltd., who have now brought out a third edition at the reduced price of 10s. 6d.

THE RHODESIAN SKULL

THE old question of the "missing link" has been revived by the recent discovery of a human skull in a cave in Rhodesia. But as yet it is quite uncertain whether this is the oldest known human fossil extant. Thirty years ago the most ancient human remains that had been excavated were those of the Neanderthal men, found in various parts of Europe. But in 1894 the remains of a far earlier type, *Pithecanthropus erectus*, were unearthed in Java by Dr. Dubois, a Dutchman; and these were assigned to the Pliocene Age, whereas the Neanderthals probably existed in the Middle Pleistocene or last Glacial Age. Dubois' "find" was, in fact, hailed in certain quarters as the "missing link" between man and ape, but most prehistorians have since agreed that this belief is impossible. Further examinations of the Rhodesian skull have yet to be made, but it is very doubtful whether they will prove its priority in age to the Java remains of *Pithecanthropus erectus*.

The new "find," however, is almost certainly more ancient than Neanderthal man, and the interesting theory to which it gives additional proof is that the human race started its career in Africa, and migrated to Europe before the existence of the Mediterranean.

Latest Developments in Aeroplanes

By "Rafex"

ALTHOUGH perhaps it is not very apparent to the public, there has been a good deal of progress in aeroplane design during the latter part of the three years which have elapsed since the Armistice. It is proposed in this article to deal chiefly with the evolution of commercial machines; mainly because it is this type which is of more immediate importance, but also because the development which has taken place in military aircraft is of less universal interest and consists, generally speaking, in a change in the details of war ideas but not a great change in those ideas themselves. Commercial aircraft, on the other hand, did not exist until after the war, and therefore any types which have been since evolved are necessarily novel. It is interesting, therefore, to watch the general trend of ideas, particularly in view of the gradual departure from the overshadowing military element which predominated even in machines produced for civil use for some time after the cessation of hostilities.

Some of us, indeed, hold the view that, despite the enormous increase in aeronautical knowledge which was made possible by the War, the development of civil aeroplanes was actually to some extent retarded rather than improved by that military effort. This was for two reasons which are more or less connected. In the first place, in military parlance the word "performance" came to have a very definite meaning, implying the sum of an aeroplane's capabilities in rate of climb, "ceiling" (maximum height attainable), speed and manœuvrability—which are set down roughly in the order of their importance for fighting purposes. Now, it is not difficult to understand that the effect of their importance in war was to stamp those characteristics of an aeroplane firmly on the mentality of the designer and pilot, with the result that the earlier commercial aeroplanes showed clearly that these four points had all been treated as still of great importance. The very advertisements of these first types, as they appeared in the aeronautical Press, showed this obsession.

The second effect of the predominance of military lines of thought arises out of this craving for high "performance." To obtain these particular characteristics it was necessary to fit wings of such a shape in section that they would produce high speed and rapid rate of climb, their capacity for weight-carrying per square foot of area being of secondary importance. Above all it was necessary to have very high engine-power; and, therefore, the aeroplane in 1918 had almost become in fact what was once stated by one of our foremost pilots

to be the desideratum of the fighting airman, the "largest possible engine with the smallest possible fringe of aeroplane round it."

But it has at last been recognised that the important characteristics for commercial work are not only quite other than those expressed by the word "performance" in military aeroplanes, but are even to some extent actively opposed to them, in the sense that the two sets of attributes could not be produced in the same design. Only one of the four military points is of equal importance in a commercial aeroplane, and that is speed; and even here it is generally true to say that a machine which is capable of maintaining an average speed of 100 miles an hour over the ground in all conditions of wind and weather—which implies a maximum speed of about 130 miles per hour—possesses a sufficient advantage over other methods of locomotion; particularly when the additional gain arising from the aeroplane's ability to follow a direct route regardless of the physical configurations of the ground below is taken into account. The three other military attributes mentioned above are not necessary; a very high "ceiling" is not a necessity in peace, because most touring is done at a height of 4,000 or 5,000 feet, and a maximum height of 20,000 feet is as much as can conceivably be required, while 15,000 feet is probably the greatest height to which the average commercial machine is ever likely to attain. Again, rate of climb becomes of very minor importance. For fighting work it was of course necessary for a machine to climb rapidly in order to get above an adversary—the upper berth being equivalent to the weather-gauge in a naval battle—but in the ordinary business of carrying goods or passengers from one place to another it is not of great importance whether fifteen minutes or half an hour is occupied, for instance, in climbing to a height of 10,000 feet. It is of course desirable to have a certain reserve of engine-power at starting in order that obstacles close round the aerodrome may be cleared with an ample margin of safety, but, beyond this, rapidity of climb is not vital.

Manœuvrability, again, is essentially a military qualification, for a pilot must be able to change his position rapidly to avoid enemy fire and when jockeying for position; but the peace-time carrier of merchandise has no need for these rapid changes of attitude. This attribute of manœuvrability is, in fact, directly opposed to the commercial requirement of steadiness as, generally speaking, and within limits, the greater the "liveliness" a machine possesses from the pilot's point of view, the less will be its quality of automatic stability and freedom from motion in rough weather.

It will thus be seen that, compared with the military aeroplane, the requirements for a commercial machine are moderate speed, weight-carrying capacity, automatic

stability, and—most important of all—economy in operation and upkeep. This has naturally meant a considerable change in the attitude of mind of those who had during five years of war become accustomed to attack the problem of design from the point of view of fighting requirements.

For some time after civil flying became permissible in the summer of 1919, the vast majority of machines used were war-types roughly adapted for passenger-carrying, by the enlargement, for instance, of the observer's cockpit to take two passengers, with the addition of a hinged cover to provide protection from the weather. This could not last for long, as it was obviously bad economy to employ an engine of 350 h.p. or more to carry two passengers. Actually the first machine designed specially for commercial work was a biplane produced by the British Aerial Transport Company and known as the "B.A.T. F.K.26" type. It was fitted with a 375 h.p. Rolls-Royce engine and carried four passengers in a comfortable cabin immediately behind the engine, the pilot sitting in a cockpit in the upper part of the fuselage towards the tail. The advantage of this arrangement, which was followed for a time by other designers, was that it provided a comparatively easy solution of a somewhat difficult problem. It will be obvious, on a little reflection, that the fore-and-aft balance of an aeroplane may be very considerably affected by a variation in the weight carried at different points along the length. This difficulty can be overcome to some extent by altering the setting of the angle of the tail plane so as to change the attitude at which the machine will fly. At the same time it is clear that the difference between the weight of a cabin when empty and when containing a full complement of four passengers (weighing altogether about 800 lbs.) must considerably affect the pilot's power of control. This problem is solved if such passenger accommodation can be concentrated at the centre of gravity (or position of fore-and-aft balance) of the machine; and that is the reason for the placing of the cabin in the B.A.T. machine at this point, with the pilot far back to balance the weight of the engine in front. Another important feature of this machine was that the control movements of the pilot's lever were transferred to the elevators and rudder by means of rods in place of the usual cable. An interesting commentary on this innovation, which has not been followed to any great extent, occurs in the report of the Committee on Safety and Economy in Commercial Flying, appointed by the Royal Aeronautical Society last year, which called attention to the fact that the renewal of frayed control cables was found to be one of the heaviest items in the upkeep of commercial aeroplanes. The disadvantage of having the pilot so far towards the rear of the machine is that his view on coming down to land is obscured by the

cabin in front of him. Accordingly this practice, which was widely adopted at one time, has gradually been abandoned, and most of the latest types have the pilot's seat as near as possible to the nose of the machine in order that he may have the best possible view in all directions. Experience and careful attention to detail design has rendered it possible for this to be done and still to retain the passenger accommodation comparatively close to the centre of gravity; although it is sometimes necessary to provide ballast where there is not a full complement of passengers. It is interesting to note, here, that many of the two-seater observation machines used during the war were almost uncontrollable if the observer's cockpit—which was situated in rear of that of the pilot—were empty, unless the place was filled by a bag of ballast. When this was not done, the machine tended to get its nose down (owing to the



FIG. 1.—DE HAVILLAND MONOPLANE.

Showing absence of bracing wires owing to cantilever construction.

weight of the engine not being counteracted) into a dive from which it could not be pulled out.

The main difficulty which had to be faced by the commercial aeroplane designer was the production of a machine which would carry an economic load of passengers—which was found to be not less than six or eight—with a reasonable engine-power. At first there was nothing between the converted single-engined war-type referred to above capable of carrying a couple of passengers, and the big twin-engined ex-bombing machine, which had its fuselage made into a cabin to accommodate ten or a dozen travellers. In the one case the horse-power was usually 350–375, while in the latter it totalled 700–750. We have already seen how the B.A.T. machine doubled the earning capacity of the first type. Further progress in this direction was much assisted through the production by the Napier Motor Company of their 450 h.p. "Lion" engine, which is at the present time almost a standard fitting in British commercial machines. This made a considerable advance on any engine that had existed

previously in lightness, reliability, and economy in fuel consumption—all attributes of extreme importance for civil work. The net result of the alliance of this engine with the greatly improved aeroplanes which were designed with a view to the special requirements of transport work is that the present-day single-engined 450 h.p. machine carries eight, and in some cases ten, passengers; while the twin-engined type, with 900 h.p., has seats provided for 16 to 20 passengers, which is a great improvement on the capabilities of the converted war machines just referred to. These figures, showing that the commercial load-carrying capacity of single-engined machines has been quadrupled with an increase in engine-power of only 20 per cent., demonstrate perhaps more clearly than anything else the strides that have been made in commercial aeroplane design since the Armistice.

Details of some representative types of modern British passenger and mail carrying machines may prove interesting. To take the large two-engined



FIG. 2.—THE HANDLEY-PAGE WING.
An experimental application to show the principle.

aeroplane first, the Handley-Page "W.8" type, which will shortly replace the converted war-bomber "O.400" type in this firm's London-Paris service, has seating accommodation for 15 passengers and is driven by two 450 h.p. Napier "Lion" engines. It has a full speed of 115 miles per hour, enabling it to maintain an average over the ground of 85 miles per hour. The saloon is a very comfortable compartment with no obstructions in the way of struts or wires, fitted with arm-chairs, beside each of which is a round glass window providing an excellent view. The two pilots sit in a small cockpit in the nose of the machine, so that they have a free outlook in every direction, and immediately behind them is a luggage compartment in which each passenger is allowed to take a certain amount of luggage free. This machine is notable for the way in which, in spite of its large size, it gets off the ground, and the steep angle at which it climbs out of the aerodrome. The same firm are making strong efforts to increase the weight-

carrying capacity of all aeroplanes by introducing a patent wing which it is hoped will provide an increase of about 20 per cent. in the commercial load which can be carried with any given horse-power. This patent, which is still the subject of experiment, consists essentially in forming each main plane of the aeroplane from a number of long narrow wings with slots between instead of having one solid wing as at present. An elementary experimental application of the idea, by putting one of these narrow wings in front of an ordinary aeroplane wing, is to be seen in the illustration on this page.

In some ways the most interesting, as it is the latest in design, of modern British machines is the De Havilland 29 Monoplane seen in the first illustration. It is perhaps not unfair to Captain De Havilland, the designer, to say that this machine shows traces of close study of German trend in design in the sense that it is of the cantilever-type method of wing construction originally introduced in Germany. This system has the advantage of eliminating all external bracing wires for the wings, which leads to simplicity: it has a neat appearance, and probably it adds four or five miles an hour at least to the speed by reducing the resistance. The two pilots' seats are well placed on the top of the fuselage just at the leading edge of the wing, while the luggage compartment is at their feet behind the 450 h.p. Napier "Lion" engine. The passenger saloon, which, unfortunately, is hidden by the wing in the illustration, is filled with bucket-seats and has long windows along each side. A noteworthy feature is the provision of an emergency exit in the roof as well as considerable door-space in the sides, which give ample chance for escape in event of a bad landing. The tail planes as well as the main wing are entirely self-supporting without external bracing, and the control cables are led direct without passing through any fairleads or pulleys to avoid the constant renewals which the friction from such guides entails. Another interesting feature is that the engine is easily removable as a separate unit with all its accessories such as carburettors, magnetos, etc.—a most important factor from the point of view of running costs, as an engine can be changed and the machine continue in service instead of its being out of commission while engine repairs are being carried out. The under-carriage is removable, with the same object. This machine is altogether a very remarkable production, as it carries, with one 450 h.p. engine, no less than twelve persons—two pilots and ten passengers—and 500 lb. of luggage a distance of 450 miles without landing. The top speed is 130 miles an hour, and with the engine running at only a little over half-power the speed is still 100 miles an hour. Generally speaking, it may almost be said that the Safety and Economy Report of the Royal Aeronautical Society referred to above

provided the "specification," because practically every recommendation contained therein has been embodied. It may be interesting to note that the cost of running the De Havilland monoplane on a single journey from London to Paris is said to be £34, while its earning capacity fully loaded is 60 guineas.

There is, unfortunately, no space in which to deal with more than one or two machines representative of modern practice, but in the same class as the De Havilland monoplane should be mentioned the Bristol Aeroplane Company's eight-passenger biplane with two pilots, commonly called the "Bristol Ten-Seater," which is, again, fitted with the Napier engine. The De Havilland 18 biplane is an intermediate type between

of a ratchet gear when it is desired to use it on water. It has been exhaustively tested for both purposes, and it is a very remarkable sight to see it alight on the Thames, "taxi" to the shore, and then climb on to land under its own power on the wheels. This is unquestionably a type of great importance to an island nation such as ours, and when it has been further developed will become a serious competitor of the aeroplane. The full speed, with Napier "Lion" engine, is 119 miles per hour, and it has a range of 480 miles with the engine throttled down to 90 miles an hour. Messrs. Vickers, Ltd., also produce the familiar "Vimy" twin-engined aeroplane which made the famous trans-Atlantic, London-Australia, and South

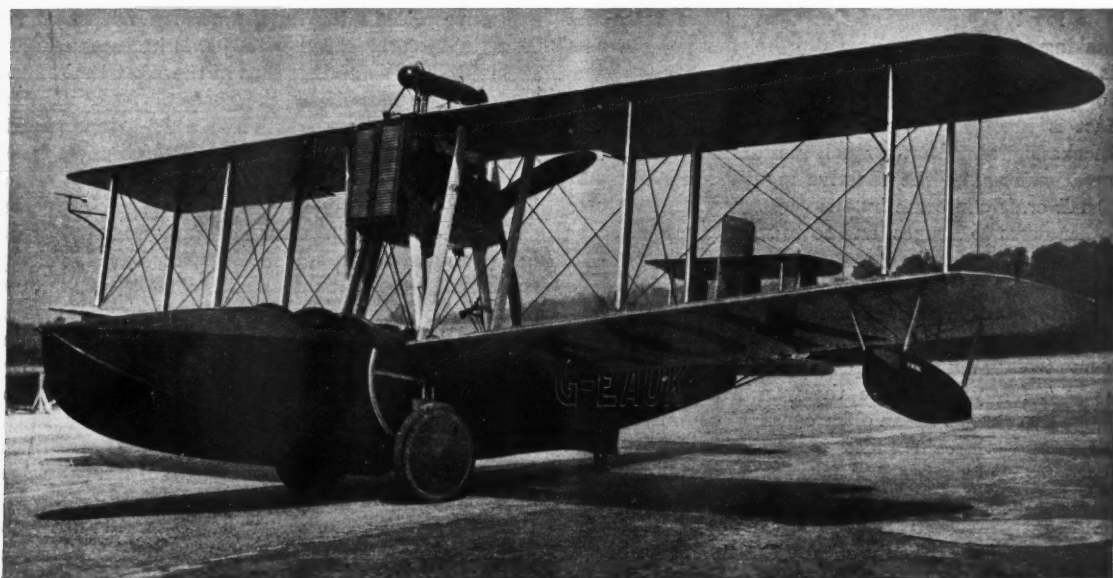


FIG. 3.—THE VICKERS "VIKING" AMPHIBIAN.
A machine for use on both land and water.

the original B.A.T. and the later types. It was one of the first machines to be fitted with the Napier engine, and carries eight passengers; the position of the pilot in rear of the cabin, but not so far down the fuselage as in the B.A.T., is to be noticed. In his later machine, the monoplane already mentioned, Captain De Havilland has moved the pilot's cockpit to the front.

An entirely post-war product is the amphibian, capable of taking off from or alighting on either land or water. The most prominent example of this class is the Vickers "Viking" shown in Fig. 3. The machine illustrated is an early experimental model, but a commercial type capable of carrying one pilot and four passengers has now been designed. This amphibian consists of a boat hull provided with landing wheels which can be wound up out of the way by means

African flights. With two Rolls-Royce "Eagle" engines of 375 h.p. each, it has accommodation, in its latest form, for fifteen passengers and has a maximum speed of a little over 100 miles an hour.

It has not been possible within the confines of this article to do more than sketch briefly the progress that has been made in the short space of two years—for little more has elapsed since commercial aviation was seriously taken up—in the evolution of aeroplanes suitable for carrying passengers and goods from the engines of war upon which the industry had been previously engaged. Perhaps, however, the real development that has taken place has been sufficiently described to indicate what may be hoped for within the next five or ten years. For ideas are now becoming crystallised as a result of the experience that has been gained.

The Raid on the Bruges—Ostend Canal in 1798

By C. S. S. Higham, M.A.

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THE Channel ports have long played a great part in the strategy of campaigns, and during the recent war the importance of controlling them was well illustrated; a very similar situation arose during the wars of the French Revolution, and a successful attempt was made to put the Bruges-Ostend Canal out of action. The low-lying nature of the country facilitates the making of such waterways, and the whole of Flanders is one network of canals which are of great importance for peaceful commerce, and doubly so for war. The fact is that this huge system makes the work of a blockading squadron a much more difficult task, and greatly increases the effective mouth of the Scheldt. Small craft can come by the canals from Antwerp or other ports to Bruges, and so to sea, and thus escape the seaward patrol.

When the ports were raided in 1918 there were two main points of attack. Zeebrugge was the more important, for it was connected with Bruges by a ship canal, some twenty-six feet deep, which had been completed only a few years before the war, while Ostend was joined to Bruges by an older canal, some fourteen feet deep and thirteen miles long. Thus Bruges had become a great harbour for submarines and small craft, which were built at Antwerp or other places, and sent in parts to Bruges by canal or rail; thence they were able to sally out by Ostend or Zeebrugge and take part in the intensive submarine campaign. Since the mouth of the Scheldt was closed by the neutrality of Holland, the problem was to seal the two entrances to the harbour of Bruges. In 1798 the problem was very similar: four years earlier the armies of the French Republic had succeeded in expelling the Allies from Belgium, or the Austrian Netherlands, as they then were, and had also captured Holland. Thus the Scheldt as well as Ostend, with its recently constructed canal from Bruges, were both in their hands, and news kept trickling through to us that the enemy were building vessels at Flushing and elsewhere, which were to assemble at Bruges for an invasion of England.

The plan of destroying the canal was conceived, and its details worked out by an energetic and restless sailor, Sir Home Popham, then a Captain in the Royal Navy. Popham was naturally interested in the problem, for he had served with the British troops in

Flanders during the recent campaign, and had been specially recommended for promotion by the Duke of York, for his able handling of the Inland Water Transport. Previously, too, he had become well acquainted with the port of Ostend, since for several years he had traded thence to the East Indies under the flag of Austria. Here, then, was a man who appreciated the importance to the French armies of the canal system of Flanders, and who realised the threat to England contained in the new Bruges-Ostend canal.

Popham's plans were ably seconded by General Sir Charles Grey, the father of the famous statesman who passed the Reform Bill, and at that time in command of the Southern district with his headquarters near Canterbury. Grey was a keen and daring soldier who had seen service in the War of American Independence: later, in 1793, he sailed with Jervis in an expedition against the French possessions in the West Indies, and distinguished himself by the perfect co-operation he secured between army and navy when a joint attack was carried out on Martinique. He now urged Popham's plans upon Dundas, Pitt's Secretary of State, and gained his permission to prepare a secret expedition. Popham had drawn up a careful memorandum on the subject: he aimed at blowing up the canal gates at Saas, a mile above Ostend, by a combined military and naval raid. "I would have all the vessels anchor in their stations in the night," he wrote, "and disembark their Troops at high water, by which means the detachment for Saas will be there and have their Petards fixed by half ebb, which is the proper time to burst the Gates, as the water will then have an amazing fall, and will render it impossible for any boat to cross the Harbor, indeed I imagine everything there will be torn away and carried to sea by so great a body of water coming down so suddenly, a quantity of silt and mud will in course also be brought down, which may tend to stop up the Harbor, especially if a vessel was sunk there at low water." This suggestion of sinking a ship in the harbour mouth is an interesting forecast of the *Vindictive*, but it went no further at the moment. Popham also submitted a diagram to show how he proposed to employ his ships, and the covering force of troops who were to screen the demolition party.

Meanwhile Grey was choosing his men and assembling them at Margate with all secrecy. "The 11th Regiment I have always meant to embark," he wrote, "they being a very good corps, and perhaps detachments from the 49th and 23rd, not wishing to embark them, but to make up the number of Troops wanted from the Flank companies; my reason for this is, the 49th are composed of raw recruits, 70 joined them on their march to Margate, and the 23rd have a great many Dutchmen in the Regt. which I do not think

exactly calculated for the intended service."¹ The Admiralty, however, seems to have been dilatory, and while Grey fumed at Canterbury the plan grew, the feasibility of bombarding Flushing was discussed, while it was decided to send some of the troops, after the raid, to capture the island of Ameland and help to blockade the Texel. On May 8 the necessary secret instructions were issued to Popham, who was to command the fleet, and emphasis was laid on the fact that the main objective was the destruction of the canal gates. One sentence deserves to be noticed: "You are to endeavour to destroy by shells whatever ships or boats may be in the port [Ostend], but if there should not be any vessels which may be so destroyed, you are not to throw shells into the town, which though it might distress Individuals, would produce neither honor nor advantage to His Majesty's arms."

The troops were embarked upon the 14th, but a gale of wind forced them to anchor off the North Foreland, and Grey was left fretting ashore, writing letter after letter to town, and, when the last post was gone, even sending a dragoon thundering along the London road by night with the good news that the fleet was ready to sail. In the early dawn of the 16th the expedition got under weigh, and Grey's excitement burst forth in his letter to Huskisson, Dundas's secretary: "I beg he [Dundas] will, in the meantime and until the issue is known (which *shall be successful*) be planning in his own mind another entertainment for our neighbours, following the one, just gone forth, vigorously up, and I will answer for his making this *great* (or rather unprincipled) *nation* sick of Invasion, and cause the People to revenge themselves of the Directory, plundering Paris, in the room of England, so insolently held out to them. Mr. Dundas will have the goodness to excuse this freedom, for I must have my say."

The troops which were embarked for this expedition were made up as follows: Eight Light Infantry companies from the Guards; four from the First Guards, and two each from the Coldstreams and the Third Guards. The whole of the 11th Foot, and the Grenadier and Light Infantry companies of the 23rd and 49th regiments. There was also a detachment of some 100 men of the Royal Artillery with guns, and in addition there were ten miners chosen from Welsh militia regiments, to help with the demolition party.² Sir Eyre Coote, the nephew of the famous Indian General, was chosen by Grey to command, and his selection was doubtless due to his previous service with Grey in the West Indies, and to his brilliant conduct during the attack on a fort in Guadeloupe. Besides Popham's

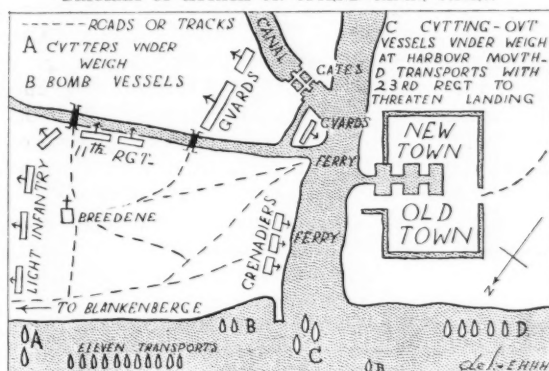
¹ The 11th Foot are now the Devons, the 23rd the Royal Welch Fusiliers, and the 49th the Royal Berkshire Regiment.

² The miners came from the following militia regiments: Somerset, 1; Denbigh, 2; Glamorgan, 7.

intimate knowledge of the port of Ostend and its neighbourhood, Coote had the help of two local guides, one who had been harbour master of Ostend during the British occupation, and the other a refugee.

The expedition had been timed to arrive in the early morning, and the enemy's coast was approached with great caution. By 1 a.m. on the 19th the ships were anchored, but the wind had shifted to the west and began to freshen; while Coote and Popham were discussing the postponement of the attempt, a boat from the *Vigilant* came alongside with the Ostend pilot boat, which she had just cut out from under a shore battery. The pilots, upon examination, confirmed the previous information that there were but few French troops on the coast, and Coote begged Popham "that he might be landed to accomplish his great object of destroying

DIAGRAM OF ATTACK ON OSTEND CANAL GATES.



Adapted from the Diagram sent to Dundas by General Grey.

NOTE.—The Grenadiers and Light Infantry were the flank companies of the three foot regiments. The actual disposition of troops at the landing had to be modified, as four companies of Guards did not land.

the canal, even if the surf should prevent his retreat being so successful as he could wish." Popham agreed, and the troops were hastily landed on the sand-dunes to the east of the harbour, without waiting for the *Minerva*, who, with the four companies of the First Guards aboard, had failed to keep touch with the convoy.

So secretly was the landing carried out that the French were not aware of what was going on until most of the men were ashore. Then a heavy bombardment began from the forts, to which the frigates and bomb-ships replied. Coote pushed forward some Guards to seize the lock gates, which they succeeded in doing after a skirmish, and a screen of troops was thrown out to cover the working party: to the East, the village of Breedene was occupied and the Blankenberghe-Ostend road covered, while on the west detachments held the two ferries which crossed the harbour from Ostend. But the old black powder of those days was a very different thing from the high explosive of

to-day, and the work of demolition a much more difficult matter: the heavy and bulky materials had to be brought ashore and then dragged across the sand-dunes for over a mile to the lock gates. While this was being done it was necessary to mislead the enemy as to the real objective of the raid, and so a detachment of troops cruised aboard some frigates to the west of the town, to make a feint of landing, while Coote and Popham, as a piece of bluff, sent a formal demand for the surrender of the town, and threatened, in case of refusal, to bombard it. To this the French commandant made the spirited reply that he would not surrender until he was buried beneath the ruins of his town; but the necessary time had been gained, and at 10.20 a.m. Popham saw the flash of the explosion, and knew that the main object of the expedition had been achieved.

In a despatch written the same day, and headed "On a Ridge of Sand Hills, three miles to the East of Ostend," Coote announced "the compleat and brilliant success attending the expedition," but the very fact that he had time to sit and write a despatch ashore meant disaster. As the men fell back to their rendezvous for re-embarkation, with a casualty list of no more than five all told, they found that the wind had become so strong that it was quite impossible to get aboard. Two boats which were filled with men capsized immediately in the surf, and it was with difficulty that the occupants were saved from drowning. There was nothing to be done but to wait on the weather, and Coote was forced to choose the best ground he could and to dig in. About daybreak the British found themselves attacked by two columns from the front, while behind them the thunder of the surf cut off all hope of retreat; then other bodies of troops appeared on either flank, and after a desperate struggle the British left, held by the 11th Foot, was driven in, and Coote, while trying to rally them, was badly wounded. Major-General Burrard took over the command, but realised he was hopelessly outnumbered, and that both his flanks were turned, so the two generals decided to surrender at discretion, thinking it "more our duty to preserve the lives of the brave men we commanded, than to sacrifice them to what, as we conceived, was a mistaken point of Honor. Had we acted differently, it is probable, that in less time than what I mentioned, their fate would have been decided by the bayonet." Some 940 of all ranks surrendered, and there were 162 casualties: thus it came that Coote's cheery despatch of the 19th was capped next by day a letter of a very different tone from Burrard, a prisoner of war, sitting beside the bed of his wounded commander in Ostend. As for Popham, he had managed to land early in the morning only to see the troops surrounded and captured, and there was nothing for him to do but to communicate with the shore by a flag of truce, and then set sail for England.

The first news reached Grey early on the 22nd in the shape of despatches from Popham, and from the officer in command of the troops who had not been landed. Grey put the best face he could on the matter. "The elements have cruelly fought against us," he wrote; "had we but been a week earlier, when the weather was fine, all would have gone happily well, and the other objects of the expedition carried into effect. As it is, our loss is trifling compared to the importance of the object gained, and which is certainly completed in all its parts." The full details did not arrive till the middle of July, when a surgeon who had been sent to Ostend by the Commander-in-Chief, the Duke of York, brought on his return a large bundle of despatches from Coote and Burrard, and Dundas had the opportunity of reading, with a wry smile, the optimistic letter written by Coote just before the final disaster.

As to the success of the expedition, its main object had certainly been achieved, and the canal left without a drop of water at low tide; but the cost was great, for at that time England could ill afford the loss of any well-trained troops, such as the four companies of Guards. The general tendency was to magnify the success, and discount the cost; indeed, as in the St. George's Day raid of 1918, the moral effect was certainly very great. Grey himself, the very embodiment of the spirit of the offensive, summed up the matter in his energetic and sprawling hand: "There appears now a perfect lull on both sides; perhaps the old saying, after a calm comes a storm, may be verified. I hope it may on our part, for we ought never to allow the opposite coast to sleep in peace."

NOTE.—The official despatches, on which this notice is based, are preserved in the Public Record Office: W.O. 1/177. Admiralty Instructions in Ad. 2/1353. There are also several references in private correspondence, and in the newspapers of the day. See also Fortescue, *History of the British Army*, vol. iv, pt. i, pp. 587-9. For the raids of 1918 see C. S. Terry, *Ostend and Zeebrugge* (Oxford University Press, 1919).

DIRTY MONEY AND DISEASE

WRITING on this subject in the October issue of the *Scientific American Monthly*, M. Jacques Bayer states that even slightly-soiled bank-notes will, on examination, be found to harbour a "number of varieties of Saccharomycetes (including brewer's yeast and various other yeasts), great numbers of microscopic algae and bacteria, various bacillæ, especially the *Bacterium terna*, which is the agent of putrefaction, and the *Leptothrix buccalis*, a parasite which is particularly abundant upon the tongue, in the saliva, and within the interstices of the teeth." The writer has noticed that the "differences in the bacteria found on bank-notes and on coins are not so great as might be supposed," though microbes are more disposed to the bank-note, and microscopic algae to coinage.

The morals are obvious!

Helium

By A. S. Russell, D.Sc.

Student of Christ Church, Oxford

THE gaseous element, helium, which has recently been brought into public notice by writers endeavouring to explain how the accident to the airship R38 might have been avoided, has had a curious and interesting history. Few of the elements have caused more surprises in the scientific world than this one, and none, by the mere fact of its existence, by its possession of certain properties and total lack of others, has had so important and far-reaching an effect upon present-day knowledge of the constitution of matter.

In describing this element I find it most convenient to treat it under seven headings, the subject matter of each of which is summarised below.

I. Helium was discovered in the sun, and much later on the earth.

II. The discovery of helium and argon led to the isolation of four more inert gaseous elements.

III. It has been experimentally proved that the atom of helium is "inside" the atoms of certain heavy atoms.

IV. It is probable that the atom of helium *may* be a constituent of many of the chemical elements.

V. The liquefaction and solidifying of helium have led to the coldest attained temperatures.

VI. Helium, a thing of purely scientific interest, became a necessity for balloons in war. It will become of increasingly practical importance for balloons and airships according as sources from which it may be isolated are explored.

I

Helium was first heard of in 1868, when it was discovered in the luminous atmosphere of gas which surrounds the sun. During a total eclipse this atmosphere was examined by a spectroscope and a new yellow spectrum-line, called the D_3 line, was observed. It had not been observed on the earth; nevertheless, the new spectrum-line was so characteristic as to leave no doubt that it came from a new element. For twenty-six years nothing was known about this element except its spectrum-lines and the fact that it existed in the sun and in certain stars; but towards the end of 1894 Sir William Ramsay showed conclusively that it existed in a rare mineral on the earth. This discovery was just missed five years earlier by a well-known American mineral-analyst, Prof. Hillebrand. In working up a specimen of the mineral pitch-blende (from which we get radium), Hillebrand obtained a gas which he supposed to be nitrogen, for so it appeared to be when tested by the ordinary methods; but one or

two curious happenings that occurred during his experiments led him to suggest to his assistant jocularly that possibly they might be also dealing with a new element. The matter, however, was not pursued farther.

In 1894 the gaseous element argon had been discovered in the atmosphere by Lord Rayleigh and Sir William Ramsay, and the latter in searching for new sources of this gas had his attention called to the "nitrogen" which Hillebrand had prepared from pitchblende. It was suggested that this might contain argon. Ramsay repeated Hillebrand's work, proved as Hillebrand had done that it contained some nitrogen, but found by the spectroscope that most of the gas was not nitrogen, and not argon, but the long-awaited helium.

It is a curious thing that often when an element has been discovered, no matter how difficult it had been to detect in the first instance, it is immediately found nearly everywhere without much difficulty. The explanation is simply that when keen and active minds have been told to look for something new, and given the necessary information to recognise it, it is largely a matter of their looking hard enough to find it.

Helium was soon found to be a constituent, but always in small quantity, of the atmosphere, of a certain class of rocks, of many mineral springs, of the sea, and of the natural gas that comes out of the ground chiefly in America. It is also found in the hotter stars and in meteorites; so that it is widely distributed.

II

A development of great theoretical interest in chemistry arose from the discovery of these two gases, argon and helium. These gases were found to possess no chemical properties, i.e. they refused to combine even under most favourable conditions with other elements. This was strange and novel behaviour, and it set many minds thinking. Now this refusal might arise for one of two reasons: (1) because these elements were completely inert and lacked the power of uniting with other elements; or (2) because they were so very active that each gas was wholly occupied in combining among itself, and so had neither opportunity nor "desire" to combine with other elements. The first of these views was adopted, and it is important because it had an interesting consequence. For if argon and helium are inert elements they are unique, i.e. they form a group by themselves. But in the Periodic System of classification such a group, if like other groups, has six members. It followed therefore that, if a new group of elements existed, and if two of them had already been isolated, four remained to be found. The truth of this view was borne out by experimental work. Three of the four—neon, kryp-

ton, and xenon—were isolated from the atmosphere by Ramsay and his co-workers in the 'nineties, and the fourth, radium emanation (or niton), was discovered emanating from preparations of radium.

III

An element isolated for the first time on the earth in 1894, and which had led directly to the discovery of four more elements in the years immediately following, had certainly made its *début*, as they say, with a certain degree of *éclat*. But even Ramsay, who was surprised at his own discovery in 1894, was still more surprised in 1903 when Soddy, in conjunction with him, proved definitely what Rutherford had suspected, that helium was produced continually by the element radium. The work of Ramsay and Soddy proved that the radio-active element radium on disintegration broke up cleanly into two elements, the emanation and helium.

	Radium	→	Emanation	+	Helium
	solid		gas		gas
Atomic weight 226			At. wt. 222		At. wt. 4

This was shown by freeing a preparation of radium completely, both from the emanation and from helium, and proving by the spectroscope that the latter accumulated in the preparation with time. This work caused a mild sensation among scientific workers of the period, because it proved definitely, what workers in radio-activity had tentatively begun to assert, that one *element* may decompose into two elements. The suggested explanation of these facts is as follows:

The atom of helium must be originally inside the atom of radium, and for some reason it is shot out with great velocity. All the expelled atoms of helium form helium gas; all the shattered atoms from which the helium atoms have been shot out form radium emanation gas. The atomic weights of radium, of the emanation, and of helium are known by *independent* experiments to be 226, 222 and 4 respectively, so that the breaking-up of radium is numerically right, since $226 = 222 + 4$.

Further study of radio-activity showed that the expulsion of helium by radium was not an isolated phenomenon. Several other elements expelled the atoms of this gas. We now know that the element uranium (which is used commercially for making pigments) has at least eight of these helium atoms in the inside of its own atom, while the element thorium (compounds of which are used for making incandescent gas mantles) has at least six, and the element radium five. These are experimental facts about which physicists have no doubt. Helium, then, appears to be a constituent of the very heaviest elements. It is not joined to them in the loose way that atoms forming

chemical compounds are, but in a more fundamental way that is quite unlike any combination in chemistry.

If helium can be proved in the laboratory to be produced by the breaking up of heavy atoms, then clearly there should be relatively large quantities of the gas in rocks containing these heavy bodies—untouched for thousands and thousands of years. Experiments have proved this to be true, and indeed one method (though not a good one) of estimating the age of these rocks is to measure accurately the quantity of helium which a known mass of these heavy elements has produced. It is believed that the quantities of helium found in the atmosphere, in mineral springs, etc., have come from the decomposition of rocks containing the heaviest elements. These indeed, like the helium they produce, are very sparsely distributed on the surface of the earth, as the unfamiliarity of their names, uranium, protactinium, thorium, ionium, etc., to all but specialists bears witness.

IV

Two important speculative ideas have been suggested by the experimental fact that helium is a constituent of the heaviest elements, namely:

(1) That helium is a constituent of all elements, or at least of many elements besides the heaviest.

(2) That hydrogen, which is the only known element lighter than helium, may also be a constituent of many elements.

The first of these alone is germane to my subject, and will be considered now. Helium is inside some heavy elements; it is natural to infer the possibility that helium is a constituent of most elements. This speculation appears to work excellently on a sheet of paper. A number of elements have atomic weights which are nearly exactly whole numbers that are divisible by 4, the atomic weight of helium. For example, carbon (12), oxygen (16), neon (20), sulphur (32), titanium (48), chromium (52), iron (56), tungsten (184), thallium (204), thorium (232). What is easier, when one is speculating, than to assume that these elements are built up exclusively of helium, i.e. that carbon is three helium atoms bound in a very fundamental way, oxygen four, iron fourteen, and thorium fifty-eight?

A simple speculation of this kind includes only those elements which have whole numbers divisible by four for their atomic weights, but if we consider a few proven experimental facts we can extend it to a great many more elements. These facts are:

(1) That all atomic weights are probably whole numbers.

(2) That an atom of hydrogen, weighing 1, exists in certain atoms (boron, nitrogen, fluorine, sodium, phosphorus, etc.).

Now every integer when divided by four gives a remainder of 0, 1, 2, or 3. In the first case speculation says the body is composed entirely of helium, in the second of helium and an atom of hydrogen, in the third of helium and two atoms of hydrogen, and in the last of helium and either three atoms of hydrogen or something else. But, of course, suggestive as these speculations are, experiment and that alone can say what the constitutions of the different elements really are. Already in one or two instances, where speculation seems clearly right, experiment has shown it is not right. Literary critics of undoubted learning and insight sometimes ascribe the authorship of an anonymous work, on internal evidence, to a certain man, and find later when the name of the real author comes out that their theory of the authorship, though clever, was quite wrong. This is an analogy from the world of letters.

But although details are at present meagre, the general idea that helium is a constituent of most of the chemical elements is considered to be broadly correct. This view receives encouragement from the astronomical facts that the hottest stars contain the light elements, hydrogen and helium, and, as the star cools, elements of greater atomic weight gradually make their appearance until, in a cold planet like our own, they exist in great variety. This suggests the formation of the heavy and complex elements out of the light and simple ones, of which the chief is helium.

V

The liquefaction and solidifying of helium have led to colder temperatures than have ever before been attained. The element does not become liquid until $4\frac{1}{2}^{\circ}$, or solid until $2\frac{1}{2}^{\circ}$, above the absolute zero of temperature. Before 1908 helium was the only gas that had resisted liquefaction. The main difficulty was to get the gas down to a temperature low enough for the ordinary process of compression and expansion, by which a gas is progressively cooled to its liquefaction point, successfully to begin. After several workers had given the problem up a Dutch experimenter, Kammerlingh Onnes, succeeded. Helium was found to boil at less than $4\frac{1}{2}^{\circ}$ Centigrade above the absolute zero of temperature. The same worker, by allowing the liquid to evaporate quickly, succeeded in obtaining the substance solid—a marvellous achievement. It is wonderful to think that man has approached within about two degrees of the very coldest temperature that can exist anywhere in the universe!

VI

It was the war that gave a practical use to helium. It is, on the whole, the best gas for filling balloons and

airships. In two respects hydrogen, which has hitherto been used for this purpose, has decided advantages: it is the lightest gas that is known and therefore the most buoyant, and it is very cheap and easily prepared in quantity; but, if safety be considered, it cannot be compared for a moment with helium. Many serious accidents happen to balloons and airships: bullets in war time and accidental fires in peace which set the hydrogen on fire. Helium, when it is pure, is perfectly safe in this respect. It will neither catch fire nor explode. The engines of the airship, indeed, may be placed inside the envelope containing the helium. Nor is the greater density of helium the serious factor which at first it may appear to be. Helium is the second lightest known gas, and its density is nearly twice that of hydrogen. Now the lifting power of a balloon or of an airship is proportional to the difference between the densities of the gas in the envelope, and of the air displaced by it. For an approximate calculation the densities of air, helium, and hydrogen may be taken as 14, 2, and 1 respectively. Thus the lifting power of helium is proportional to $14 - 2$, i.e. 12, and that of hydrogen to $14 - 1$, i.e. 13. Their lifting powers are therefore as 12 to 13, or, expressed otherwise, that of helium is 92 per cent. of that of hydrogen. This, of course, is not a serious difference, and may be somewhat reduced by heating the helium electrically, thereby decreasing its density and so increasing its buoyancy.

The grave difficulty in substituting helium for hydrogen lies in the trouble and expense of getting an adequate supply of the former. The airship R38 had gas-bags which held about 2,750,000 cubic feet, while helium is apparently a rare element, widely distributed perhaps, but always in small quantities. In the atmosphere near the earth only there is, for example, 1 part by volume of it in 185,000 parts of air. (Higher up, however, it has been calculated, the amount is greater, and sixty miles up it is said to be nearly 1 part in 200. Other theorists claim that the atmosphere at this height consists almost entirely of helium. But how are you going to bring it to earth?) Again, in the gases from mineral waters the amount of helium is rarely as high as 1 per cent., though one spring in France contains more than 5 per cent. About $1\frac{1}{2}$ is the highest percentage that has been found in natural gas.

These results show that, unless the sources are very abundant, and the methods of separation cheap, helium must be a costly substance. An investigation of the helium sources throughout the Empire, and the best methods of separating it, was begun in 1915. The natural gas of Canada (and later of U.S.A.) was found to be the best source; the best method of separation to be fractional distillation. Plants were erected which produced 50,000 cubic feet per day at a cost of about

£20 per thousand cubic feet. Now the envelope of a kite balloon has a capacity of about 25,000 cubic feet. A single plant could thus fill two of them a day at a cost of £500 each. An airship like the R38, with a capacity of 2,750,000 cubic feet, would need 55 days' output, and the cost of the gas would be about £55,000! These figures seem very pessimistic, yet really they indicate a great advance. Until the war helium was regarded as being of scientific interest only, and the idea of filling a balloon with it would have been regarded as being as fantastic, it has been said, as paving the Strand with diamonds.

The practical man knows that much has to be done before helium will be cheap, but we may safely trust the men whose enterprise is directed at effecting this in the future. Needs must. . . . Helium is scientifically the safest gas for balloons and airships; man must therefore have it.

REFERENCES

- J. R. Partington, *Textbook of Inorganic Chemistry* (Macmillan), p. 603 and ch. li.
 H. F. V. Briscoe, *Textbook of Inorganic Chemistry*, ed. by J. N. Friend (Crosby Lockwood), vol. i, pt. ii, ch. ii.
Nature, vol. 102 (1919), p. 487.

Some Social Survivals of Rural Japan

By the Rev. Walter Weston, M.A.,
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Late British Chaplain at Yokohama

A STRIKING feature of the activities of agricultural Japan is the part played in them by women. In the planting, transplanting, and harvesting of the rice, they are always to the fore, and they tend the silkworm and conduct nearly all the operations connected with it; they pick and later on fire the tea. In fact, no labour comes amiss to them. So it is not surprising to find that, in a country notorious above all others for its large percentage of divorces, the proportion of these is lowest among the rural population. It is also not surprising that these useful and inexpensive helpers have relatively more liberty and a higher position than the wives of the "upper" classes. The wife of the peasant shares not only her husband's labours but also his counsels, and it is often she who keeps the

purse and really governs the family. At one hamlet in the Southern Japanese Alps, I found the heads of households were all women, and was informed that for any male outsider, rash enough to intermarry there, life was apt to be both bitter and brief. The place was known as *Onna-taka*—"Woman's Hill"—and, thanks to the rule of a bitter tongue and a heavy hand, that fact was not suffered to be overlooked. Sometimes one was told of a village that it was notorious as *kakadenka*—"woman's throne"—which, too, denoted a similar relation of the sexes.

In the secluded hamlet of Narada, in the Southern Alps, all the inhabitants bear the same name, Fukazawa, and it is perhaps due to the traditional pre-eminence of women in bygone days that the "Seven Wonders of Narada" are proudly pointed out to the traveller as the gifts of a beautiful and gracious lady, who once visited the valley and endowed it with these treasures. The chief of them have a specially domestic value; there is the pool whose waters, used for laundry purposes, have magical properties; there is the "Betel-nut Pond," in which articles of clothing embedded in the bottommost mud assume the deep purple-black hue which is highly prized; and there is the "Salt Pool"—until the visit of the Fairy Godmother of Narada, salt was unknown to the Fukazawa families, but the waters of this pool, saline and exceedingly hot, made it possible for them both to season and cook their vegetables in a single process.

Domestic institutions of an extraordinarily primitive character exist in some of the remoter valleys, as, for instance, in that of the River Shirakawa. This lies in the province of Hida, in the centre of the main island, popularly called the "Island Province" on account of its isolated and inaccessible character, for it is cut off from the rest of the island by a cordon of lofty mountain ranges. It is also singular as the one province which, in feudal times, knew no *samurai*¹ and acknowledged the rule of no *Daimyo* (feudal lord). In this valley one finds whole families dwelling under one roof of gigantic size, for the family includes not merely parents and children, but also uncles, aunts, nephews, nieces, grandchildren, and other relations to the number of fifty or more. The heads of such

¹ *Samurai*, from *samurai*—"to guard," or "be in attendance on"—was originally used of the soldiers stationed at the palaces of the Mikado (= "Sublime Porte"), but later on was also applied to the retainers of the *Daimyo* of the feudal ages. Its equivalent in English connotes the "warriors," "Military class," or "gentry." Feudal Japan expected all gentlemen to be soldiers, and all soldiers to be gentlemen. The mental outlook of the *samurai* greatly resembled that of the nobility and gentry of our own Middle Ages. Birth and breeding alone counted, and not money, while unquestioning obedience was expected and cheerfully rendered.

families have almost despotic authority, and only the heir, who is usually, though not invariably, the eldest son, is allowed to marry. The other sons make irregular unions, the children of which are adopted into the family of the mother. Some of the "villages" number only two or three houses, while in one case there is but a single house and to that is allotted a post-office of its own! In some of the side valleys leading off the main one a distinct type of physiognomy has been observed. While the girls are noted for their good looks, both they and the men generally possess oval faces, a white complexion and regular features. My friend, Mr. Oswald White, the British Consul at Nagasaki, one of the few European travellers who have visited the valley, tells me that these types appear to be possibly of Korean origin, a conjecture which has additional support from the fact that the northern borders of the province in which they are found are within a few miles of the sea, across which Korea is easily accessible.

A tragic light was thrown on some of the strange social survivals that are occasionally encountered in secluded communities far removed from the sphere of law and order administered by their official representatives, through the discovery, by my hunters and myself, of the remains of some unfortunate man who had met the fate most repellent to a Japanese—a violent death followed by no burial rites. Near the foot of a peak in the heart of the Northern Japanese Alps we found the bones of an outlaw whose fellow-villagers had expelled him from their midst many years before on account of his quarrelsome disposition and unruly deeds. Some sort of mutual discipline was an absolute necessity in lonely spots where no guardians of the peace were at hand to help. For the common good it was usual, in the case of such a persistent and intractable reprobate, to erase his name for ever from the village register, to present him with his birth certificate, and then drive him forth never to return. He then became a *hi-nin-a* ("no man"), a human being who no longer possessed the rights or privileges of manhood or of citizenship, for henceforth he belonged to neither State, village, nor family. He was not only without a home, but almost without a hope in the world, for it was practically impossible for him to obtain employment or assistance of any kind, however sore his need.

The hideousness of such a prospect can be fully understood only by those who are familiar with the exceedingly sociable character of the dwellers in rural Japan and the communistic nature of their daily life and toil. There is, perhaps, no more interesting or entertaining illustration of this engaging feature of peasant life than is to be seen in the habits and customs connected with the use of the "honourable hot water,"

whether in the semi-private bath of the country inn, or in that public and popular institution, the mountain mineral spring. Each of these is characteristically Japanese.

The European traveller on the unfrequented ways, if he asks for the bathroom, will be conducted to the corner of the front verandah of the house and invited to step into the large oval tub that serves for bath, and there submit to that process of prolonged soaking which constitutes the Japanese idea of a hot bath. He will be expected to do this in full view of the friendly passers by, with whom he can the more pleasantly pass the time in conversation. There is, however, usually some competition for the privilege of the first dip, if such a term is sufficiently descriptive of an operation which involves a half-hour of parboiling at a temperature of 110-115° F.,



WOMAN CUTTING RICE STRAW.

succeeded by the actual washing done *outside* the bath. Next follow, after his exit, the other guests in order of arrival or of dignity, as the case may be—men *always* first, then the landlord, succeeded by the remaining males of the family. Finally, after the landlady and the other female relatives have finished, come the domestics, irrespective of sex, according to the size of the tub and to the number desirous of getting in at the same time. Thus the splashing and chattering go on without ceasing for five or six hours at a stretch.

But it is the mountain mineral spring—the *onsen*—that furnishes us with the most striking and characteristic popular institution of rural Japan, giving, as it does, full scope to the sociability of its inhabitants; there is nothing quite like it in any other land. It is

a natural outcome of the highly volcanic mountain ranges in which the country abounds and it is highly prized by the peasantry and by the many outside visitors attracted to the healing waters, either for the sake of health or in order to kill time pleasantly in the company

in the hills, whose favourite pastime is to beguile the hours spent in the bath with the recital, in the loud falsetto affected by the Japanese drama, of portions of popular plays, to which the damp air and confined space are held to lend enhanced effect. In this respect



A SECLUDED VALLEY ON THE WESTERN OUTSKIRTS OF THE MAIN RANGE OF THE NORTHERN JAPANESE ALPS.

of their friends. Although in some cases one now finds separate compartments reserved for those who prefer to bathe privately, it is much more usual for a number of persons to bathe together without distinction of age, sex, or class. At one time in some of the towns, out of deference to European ideas of privacy, a cord was stretched across the big wooden tanks with the notice, "This side for ladies: that for gentlemen." But in the country-side such refinement is rarely observed, yet everything is conducted with the utmost propriety and decorum.

Among the more educated habitués of the *onsen* are found young men of the student class, holiday-making

they differ seriously from the ancient Greeks, whom in so many other ways they resemble, for the Athenians considered noisy singing in the public baths a particular sign of boorish behaviour. One of the *onsen* in the Northern Japanese Alps, Shirahone in Shinshu, has been in the possession of the family of its present owners for three hundred years. When my wife and I visited it in 1914, we noticed the edge of the main public tank was lined with a number of large water-worn boulders from the bed of the neighbouring mountain torrent. These, we were informed, were for the use of the bathers, who lay them in their laps at night when going to "bed" to prevent them from "turning

turtle" and drowning in their sleep! Such hardened habitués will spend three or four weeks at a stretch, practically with no break, in the water, and a case was mentioned to me by a friend, Professor Chamberlain, of the old caretaker of an inland spa who used to pass the whole winter in the soothing waters of his own particular spring. When my friend visited another spring in the summer the inhabitants apologised for their dirty condition; "for," said they, "we are now so busy that we are only able to get two baths a day."

"How often, then, do you manage to bathe in winter?" he asked.

"Oh, then we are not so busy and can have four or five baths a day, and the children get into the hot water whenever they feel cold."

One spa I visited had a list of twenty-eight specific diseases it could cure, beginning with brain disease and ending with paralysis. The only complaint stated to be incurable was the disease of love!

The obstacles in the way of inland transport in Japan are indeed formidable, since three-quarters of the country's area is mountain land. There is this year being celebrated the jubilee of the completion of the first railway, the stretch of eighteen miles between Tokyo and Yokohama, opened in 1871, but during the intervening years no less than six thousand miles have been added, and only those who are familiar with the immense and varied natural difficulties met with can adequately appreciate the greatness of this achievement. In the Nakasendo portion of the Central Railway—between Kyoto and Tokyo, one of the most mountainous regions in the main island—95 tunnels and 350 bridges had to be constructed. And yet, in spite of the immense progress thus accomplished, there lie thousands of square miles of mountain-land and forest sparsely populated or inhabited only by a few charcoal-burners, fishermen, and wood-cutters, whose means of transport and of intercommunication are of the simplest and often of the roughest nature. Leaving behind the region of the rail and the motor-car, we find ourselves committed to the untender mercies of the native carriage known as the *basha*, whose appearance is a cross between a hearse and an ambulance wagon, while its behaviour on the average country road, boulder-strewn and rutty, deep in mud or dust, frequently suggests the prospect of its employment in the capacity of one or other of those conveyances. Under favourable conditions it can cover four to five miles an hour. On mountain paths inaccessible to the *basha*, baggage is transferred to the back of the weedy and infrequent horse or to that of the more sturdy ox, or, when neither of these is obtainable, to the shoulders of the peasant coolie whose simple good-humour and friendly companionship is a very attractive feature of one's wanderings away from the

beaten tracks of modern Japan. The carrying capacity of some of these is considerable, in spite of their smallness of stature and often slightness of build, although it is often the young peasant girls whose feats of portage are most remarkable. I have met maidens of fifteen or sixteen toiling up a steep mountain pass under a load of logs over 100 lb. in weight.

Another entertaining, and at times exciting, method of transport, linking up the Tokaido Railway with the pilgrim-routes further in the interior, is occasionally encountered in the foot-hills near the broad-spread base of Fuji-san. This is provided by the quaint one-horse tramcar. The downward car always has the right of way, a privilege its conductor exercises to the full. Sometimes the ascending rival is hoisted bodily off the rails, or the occupants of both change places. On one occasion a freight car, laden with luggage, was taken in charge by the conductor of that in which I



"YUBA" (BATH-HOUSE) OF SHIRAHONE ONSEN IN THE NORTHERN JAPANESE ALPS.

This onsen has been in the possession of the family which still owns it for over 300 years.

was travelling, whereupon he unyoked its labouring horse, mounted the roof, and thus rode down in triumph to the next siding, where he shunted it to await a suitable opportunity for removal, and then resumed his own proper command. Some years ago, for the benefit of any possible European travellers, the follow-

ing warning in English was posted in one of these vehicles, though it is only fair to explain that the apparent discrimination was by no means intentionally offensive:—

All parsons who are intoxicated, lunatics, or infected are not allowed in here!

The rural Japanese always show courtesy and kindness to strangers, a fact which I emphasised in an earlier article in *DISCOVERY*,¹ but I cannot refrain from giving some further illustrations of these characteristics here. Years ago, in the course of the exploration of the fine but unfamiliar peak of Akaishi-san, in the central mass of the Southern Japanese Alps, I was



TWO HUNTERS IN THE NORTHERN JAPANESE ALPS.
Note the two distinct types: on the left the pudding-faced Japanese peasant,
and on the right the Korean.

conducted, through the kind offices of the local policeman, whose remote and lonely beat took him nearest to the foot of my peak, to the shelter of the *onsen* of Koshibu, the most secluded I had ever yet seen, and hitherto unvisited by any European traveller. Its guardian was a venerable old man of seventy-three, with patriarchal air and prince-like manners. The large bath tank, some twelve feet square, with its water heated to about 120° F., stood before the entrance of the rough *chalet* which did duty for an inn, and was occupied, on my arrival, by a dozen bathers of both sexes. My request for accommodation was received with many signs of embarrassment and with

apologies for the deficiencies of his house; "for you see, sir," said he, "you are the first foreign gentleman I have ever seen and my accommodation is so disgustingly filthy that it is abominably rude of me to offer it to you." He subsequently, unknown to me, turned out the family party occupying the best room, such as it was, and offered to eject the bathers from the bath, in order that I might enjoy them both in privacy. He only begged one favour in return, which was that when the time for my evening meal arrived he might be allowed to sit on the doorstep of my chamber and watch me eat in "foreign style with foreign food." During the days of my sojourn under his primitive but most hospitable roof his sole prepossession was to minister to my comfort and, indeed, to anticipate my every wish; slender and simple though his resources were. When at length I was about to take my leave and no bill was forthcoming, I begged to know the amount of my indebtedness. At first he refused payment, but at length, after much persuasion, he succeeded in stammering out:

"Do you think that 5 *sen* (a penny farthing) would be too much?"

On my way back down the valley I paid a second visit to a little inn whose landlord had already received me with much hospitable attention. No sooner had I arrived than he at once dispatched, unasked, a messenger to a village in a neighbouring valley to bring back for my inspection a wonderful stone which he was told had been discovered in the stomach of an *iwashika* (mountain antelope), the chamois of the Japanese Alps. It proved to be about the size and shape of a turkey's egg, of a buff colour and quite smooth, except on one side where a piece had been chipped off. Subsequent investigation revealed it to be a *bezoar* stone such as is described by Dr. Bonney in his *Alpine Regions*,² p. 180, when speaking of the chamois of Switzerland: "Owing probably to the resin contained in so much of their food and its fibrous character, a hard, dark-coloured ball, from the size of a walnut to that of an egg, of a bitter taste but of a pleasant odour, is often found in their stomachs. This is called 'Bezoar,' and it was anciently supposed to cure all evils and to be a protection even against musket shots."

Later on I found myself once more beyond the region of hotels or inns, bound for the ascent of Jonendake, another fine peak hitherto unascended by foreign travellers, and was constrained to throw myself on the hospitality of a complete stranger, the patriarchal head man of a small scattered hamlet in the foot-hills west of the Matsumoto plain amid the Northern Alps of Japan. On making known my object, I was received with the politest of greetings, first from the good *soncho*

¹ Vol. ii, No. 21.

² Published by Deighton, Bell & Co., Cambridge, 1868.

and then from his eldest son, and after tea and cakes had been produced on the verandah we moved into a beautiful guest-room, which, with humble apologies for its "disgustingly filthy accommodation," was placed at my disposal. Nothing could have been more delightful than the attentive interest with which my plans were listened to, though the idea of a stranger coming so far and taking so much trouble to climb unknown mountains for pleasure was wholly unintelligible to these old-world dwellers in the fields. The most experienced hunters of the little hamlet were summoned to act as my guides, and when I fared forth at dawn on the morrow I found that, to do me special honour, the son of the house himself was there to bear me company. On the evening of the following day, after a delightful and successful expedition, we approached the parental roof once more, when, to my surprise, my companion abruptly left me without a word and disappeared within the family apartments. For the moment I felt considerable embarrassment at the possibility of some unwitting offence on my part; but when presently a little maid appeared and, bowing her head to the matted floor, humbly begged me to "augustly condescend to enter the honourable hot bath," I saw my young friend's haste had been simply due to his hospitable desire to have my bath ready on my arrival. To this day, over the intervening years, I can still gratefully hear the farewell greeting with which the next morning I was sped on my way: "Please honourably deign to come back to us again." I felt anew that the ancient title of his land, *Kunshi no Koku* ("the Country of Gentlemen"), was still justified in such men as the Yamaguchi *soncho* of Iwahara.

British Agriculture and the Food Supply

By E. W. Shanahan, M.A., D.Sc.

THE Government has decided to decontrol agriculture, but, even if this decision had not been taken, it is fairly clear that, so long as Great Britain retains its industrial prosperity, it cannot hope to obtain much more than one-half of its total food consumption from within the British Isles. For over a century past the latter have been a deficiency area in respect of food-stuffs.

Time and again in the past, but especially during the war period, it has been maintained that this country could easily become much more self-supporting in the matter of food supplies of non-tropical origin. Nevertheless, during the last fifty years, except for a brief

period between 1915 and 1919, there has been a gradual but continuous decline in the proportion of the total food consumed in the United Kingdom that was actually produced there. These islands are not adapted to cereal cultivation on a large scale; good wheat land is limited, the climate is uncertain, and the profits to be derived from this branch of agriculture relatively small. Except in favoured parts, therefore, wheat crops tend to be grown as little more than a sideline in the general scheme of rotation-farming. An extension of the wheat-area at the present time could be obtained only at increased prices for all wheat raised here, and the increase would necessarily fall directly or indirectly upon the nation as consumers and render it that much poorer. Some money might be saved from "going out of the country," but it would be dear money.

The present standing of British agriculture is due to a balance of remunerativeness between that industry on the one hand and manufactures and commerce on the other. Great Britain has hitherto been a relatively rich country just because a number of its citizens were engaged in business more remunerative than agriculture; they received on the average a greater return for, say, each hour's work than did the people of most other countries. If manufactures, mining, and commerce had not been so profitable, it is almost certain that a greater proportion of the population would have been engaged in producing food and that the country would have been more self-supporting in respect of such necessities. We cannot have it both ways. To wish now for a greater proportion of home-grown food in our dietary is to wish that we should all be poorer, either through having to work harder for what we get, as some of our neighbours do, or by getting less for the same work; unless farmers as a body become very intelligent and enterprising and the internal system of marketing farm-produce much more economical; or unless, forsooth, we can persuade those engaged in agriculture to work harder than the rest of the population without extra remuneration. We could, of course, contrive to levy a tax on all non-agricultural industries, and assist agriculture with the proceeds, and thus probably succeed in diverting some attention from the former to the latter, from the more profitable to the less profitable industry.

It would indeed be remarkable if the people of the British Isles were now producing anything approaching the whole of their food requirements. Owing to their wealth they have learned to expect a high standard of diet, one in which foods such as meat, that require for their production a comparatively large area of land per unit of nourishment, occupy an important place; so that the agricultural resources demanded by each inhabitant in Great Britain are greater than for any

other country in Europe. Not only do the British Isles carry a denser population than almost any other European country, but they contain extensive areas of unproductive land in Scotland, Ireland, Wales, and even in England, so that their density of population per square mile of productive area is nearly as great as that in any region populated by white races, and is much greater than in most such. Nor do they contain extensive areas of rich alluvial soils or loam-covered lands such as are found in a number of other densely peopled regions. Finally, in no other country in the world is such a large proportion of the population engaged in non-agricultural pursuits. In pre-war years Great Britain was easily the first manufacturing and commercial country in the world. Had it also been able to supply locally most of its food, its people would certainly have been by far the most energetic of races, and their wealth would have been great enough to hold the rest of mankind in tribute.

Those who urge a great extension of agricultural productiveness in the British Isles are apt to refer us to some of our neighbours as examples of what can be done, in particular to Denmark and Holland. Now, undoubtedly, the people of these countries make better use of their soil resources than we do. In the first place, however, they probably work harder than English people, and give more attention to detail, either by necessity, by nature, or through choice. Moreover, with the exception of commerce in Holland, there are no great competing industries in either country, so that the best brains turn largely to agriculture. This leads to a homogeneity of interests among the people, and the policy of the governments tends to favour that industry in which most of its citizens are grouped. Apart from all this, the agricultural surplus of these countries as usually given in the form of gross exports is deceptive. It is the net surplus that matters; now Holland imports a much greater value of food materials than it exports, and from the value of Danish exports of animal produce nearly one-half has to be deducted for imports of cereals, food-stuffs, and fertilisers; both countries, like Great Britain, depend largely upon external sources for their supplies of bread-stuffs.

In almost all the countries of North-Western Europe the normal imports of feed-stuffs are partly disguised in the form of enormous consignments of food materials for animals. In point of fact, Denmark and Holland have largely transformed their animal industries into a species of manufacture; they convert the imported maize, oil-cakes, etc., supplemented with home-grown fodders, into high-class goods, such as butter, bacon and eggs, for the export trade. There are similar extensive imports of feeding-stuffs into Great Britain and Ireland, which might conceivably have been lessened by an increased production of home-grown

fodders. Failing such increase in the future, there would, in order to produce more of our meat and dairy produce at home, be a greater, rather than a smaller, dependence upon shipping to carry food materials directly or indirectly to our shores, since it takes not less than 10 lbs. of grain to produce 1 lb. of meat. The trouble would not end there, because, owing to the normal excess of inward over outward cargoes, it follows that all inward freights would tend to rise.¹ If by any chance the people of the British Isles decided to import sufficient quantities of feeding-stuffs to produce all their requirements in animal foods even with the maximum of farm-grown fodders, they would soon be up against an economic *impasse* on putting the plan into practice; the rise in the prices of imported fodders, together with the simultaneous fall in the world prices of meat and butter, following upon the restriction of the chief market for the latter, would turn any possible profit into a loss, unless the whole change were made very slowly; even then a point would probably arise some time before the transformation was complete, when home conversion of feeding-stuffs would be unprofitable; for the heavier freights would be a standing obstacle, and there are, moreover, many overseas areas that, owing to scarcity of labour, to climate, and to abundance of grasslands must be pastoral rather than agricultural, whatever were the relative prices of pasture-produced meat and butter on the one hand, and grain and seed fodders on the other.

Agriculture in the older-settled regions has to face fierce competition from the newer. This holds in North America as well as in Europe. Thus, American statistics inform us that the States of New York, New Jersey, Massachusetts and Pennsylvania, formerly in the main agricultural States, now annually consume together 105,000,000 more bushels than they produce. A predominantly manufacturing area such as North-Eastern America or Great Britain can scarcely afford to raise its food prices above the world level in order to protect its farmers. That would involve its industries in the payment of wages containing an excess element in the form of the difference between its food prices and those of the areas in or with which its products would have to compete. The British farmer is in the unfortunate position of being compelled to see the interests of his business take a second place; he must subserve the life-forces of the nation.

Assuming that means could be devised to render the British Isles largely independent of external non-tropical food supplies, there would be disadvantages,

¹ Since some ships already have to leave British ports partly or entirely in ballast, any change such as that suggested, involving an increase in the tonnage of goods imported, would mean still more unprofitable space on outward voyages, the cost of which would be added to inward freights.

perhaps even dangers, to be reckoned with from the Imperial point of view. The four leading self-governing Dominions look to Great Britain as the chief, and almost the only, market for their principal exports, namely agricultural products.

The complex economic tie is the chief bond that unites these new British lands with the old one. More than that, it gives British manufacturers seeking markets in these countries a pull over competitors, because the Dominions prefer to buy from their chief customer, even if prices are somewhat higher, and because the large streams of shipping employed in carrying agricultural produce home to Britain, provide space and more reasonable freights for British manufactures outwards. If the British market for agricultural products were largely lost, an unfavourable readjustment might follow in the trade in her manufactures.

May it not be urged, however that British farming has advantages of a peculiar nature, not possessed in general by farming in other countries, which it can exploit to its own benefit and to that of the nation? There is a good deal to support this suggestion. Owing to their low mean elevation and to their oceanic situation, the British Isles are pre-eminently suited to grasses, and though the hill pastures, constituting the best all-round sheep lands in the world, are probably now utilised to the best advantage, much more might possibly be done than we find at present in increasing the food yield of the lowlands. A pasture country such as ours is naturally adapted to numerous fodder crops. The area of these could with favourable conditions be greatly increased at the expense of part of the heavy acreage of permanent meadow land, under some appropriate system of rotation, and the result would be a net gain in food production. Here, however, investigation and research are required to discover new or improved fodder crops that are especially adapted to different British localities. It is essential that such crops should have a productiveness or an economic utility peculiar to the British Isles. For there are few secrets in agriculture, and improvements made here would soon be adopted in other countries if applicable there, and the resulting competition in prices would cancel the advantage aimed at. In the present conditions we are faced with this dilemma: if the country becomes poor enough to find it profitable to divert more labour to agriculture it will not be rich enough to afford the same expenditure upon high-class foods such as meat and butter, for the production of which British resources are peculiarly adapted—unless everyone is willing to work harder so as to have more wealth at command, which does not seem to be the tendency at present. Hence arises the need for specialisation in the direction above referred to, aiming

at reduced costs of production through the exploitation of special advantages.

Whatever compromise with the economic situation is suggested by considerations of military safety and of the effects of undue specialisation in industry, the main point remains that any of the conditions capable of promoting an increase of home-produced food would, after all, be such as to alter the relative advantages of agricultural and non-agricultural industries; and these conditions fall under three heads: those that arise from within agriculture itself, such as improvements in methods and organisation (and these are the most desirable), those that are external to agriculture and artificial, such as tariffs, bounties, and subsidies, against which there are weighty objections, and those that would follow from a relative decline in British manufacturing and commercial prosperity which we earnestly hope may never be realised.

BIBLIOGRAPHY

- Dominions Royal Commission: Final Report (Cd. 8462). 2s. 6d.
 Inter-Departmental Committee on Meat Supplies: Report (Cmd. 456). 3d.
 Royal Commission on Agriculture: Interim Report (Cmd. 473). 3d.
 Rew, Sir R. H.: *Food Supplies in Peace and War*, 6s. 6d.
 Shanahan, E. W.: *Animal Food-stuffs*, 1920 (Routledge, 10s. 6d.).
 Wood, T. B.: *The National Food Supply*, 1917 (Cambridge University Press, 6d.).

New Tendencies in French Fiction

By Mariette Soman, Docteur d'Université

M. ANDRÉ MAUROIS, author of *Colonel Bramble*, has recently given some addresses at the Institut Français, entitled "A la découverte des Anglais." Apparently, one of the lessons taught us by the war is that two nations may exist for many centuries cheek by jowl, may engage in wars both with and against one another, may form and dissolve alliances, may teach one another's language and copy one another's hats, and yet in the end remain strangers as far as character is concerned. The French are just beginning to discover the English. It is doubtful whether the English have even begun to discover the French. One of the richest fields for psychological investigation has, up to the present, been almost neglected by us—the field of imaginative literature. The authors who are ranked

by the French people of our generation as "first-class" are scarcely known by name on this side of the Channel. Often it is ten or fifteen years before a work of genius such as Guillaumin's *Vie d'un Simple* (*Life of a Simple Man*) is accorded a notice in an English review. The average English reader of French still regards Loti and Bourget as the chief representatives of modern French fiction. *Jean Christophe*, the works of Anatole France, and an occasional novel such as *Marie Claire* or *Colonel Bramble*, have found translators and a large circle of admirers in this country. But what of the numbers of books that are yearly awarded the highest honours of the French nation—the Prix de l'Académie, the Prix Goncourt, the Prix de la Vie Heureuse? Why do we English not ask ourselves what these works stand for, and seek some index to the French mind and character in the literary creations that the French themselves admire?

The list of novels given at the end of this survey has been compiled from French, not English, sources; it contains some of the books that literary France is reading and discussing. It is no idle task for an Englishman to try to discover, first, the mental, moral, and spiritual tendencies of their authors, as representatives of their nation, and then to use them as clues to the mental, moral, and spiritual values of their readers. "Tell me what you read, and I will tell you what you are."

The law of supply and demand holds good in art and literature as in more materialistic spheres. The average Englishman's desire for the greatest amount of physical activity combined with the smallest mental effort produces the prolific adventure-novel, spy-story, and their like. The French love of psychological analysis accounts for the fact that every French novel may be classed as a "psychological novel." The reason why the novels of Pierre Benoît are becoming so popular in England is that they are rare examples of French stories whose interest is historical rather than psychological—something happens. If there is analysis of character, it takes a subordinate place; what matters is the working out of the plot, with its local colour and historical setting.

But *L'Atlantide* (*Atlantis*) and *Pour Don Carlos* (*For Don Carlos*) are freaks among the family of French novels. The normal novel may deal with love, or with religion, or with the various social and industrial questions of the day, or with child-life and adolescence, or with life in some lonely farm in a distant French province; no matter what the outward pretext may be, the underlying motive is inevitably psychological analysis. If classification were not out of fashion, it might be an interesting task to divide French fiction into various classes of psychological investigation, as, for instance, the psychology of passion, the

psychology of religious experience, the psychology of maternity, and so on. There is a very large class of novels devoted to the study of childhood and adolescence. Most of these take the form of reminiscences, as, for example, the three volumes by Anatole France which relate the author's early life, *Le livre de mon ami* (*My Friend's Book*), *Le Petit Pierre* (*Little Peter*), and *Pierre Nozière*. Others, less numerous, are stories about a child, written for grown-ups. Of these, M. Lichtenberger's *Mon Petit Trott* (*My Little Trott*) is the best example, though Jules Renard's *Poils de Carotte* (*Carrots*) runs it very close in popularity. Charles-Louis Philippe's *La Mère et l'Enfant* (*Mother and Child*) paints a touching portrait of a child of poor country folk, left to suffer from a lingering disease because his parents are too simple and ignorant to give him the proper treatment. Their attitude is typical of their class; Fate has sent misfortune to their child, and all they can do is to surround him with tenderness and love and leave him to suffer.

The impression of morbidity left by this book is not uncommon. Scarcely one of the child heroes or heroines (these are very rare) of these French tales would be passed by an Englishman as a normal, healthy specimen of humanity. Take the childhood of that infant prodigy, Jean Christophe. Nothing could be more neurotic than the state of that small boy, and the fact of his genius does not sufficiently account for his neuroticism. One of the most artistic descriptions of a childish mentality is that given by Marcel Proust in the first few chapters of *Du Côté de chez Swann* (*Towards Swann's House*). Yet it is quite obvious, from the first page, that the child is hypersensitive, almost hysterical, and that any sane parent would have either packed him off to school or provided him with companions of his own age long before he had had time to find out so much about his own sensations and ideas.

The general impression made on an English reader by all these studies of child-life is that there are no French children; only infants and "young people." But the fact that French authors think it worth while to record their early life, mostly with regret for its lack of joyousness, may perhaps indicate an approaching change in the upbringing of the French child. Up to the present, there appear to be only two alternatives for the child in a French household—either to lead its own inner life (rather a melancholy inner life), apart from the "grown-ups" who make no effort to understand its griefs and joys; or to take an active part in the general affairs of the family, and thus to develop rapidly into a miniature man or woman of the world. Nursery life in the English sense is a thing unknown in France, a state of things undoubtedly resulting from the facts that large families are rare, and that the Latin races are naturally more quick in developing than the

Anglo-Saxon. The sixteen and seventeen year old heroines of Francis Jammes' studies in sex-psychology [Clara Ellébeuse and Almaïde in the *Roman du Lièvre* (*The Hare's Story*)] appear extraordinarily precocious to an English reader. At an age when an English girl would be playing hockey and tennis, training as a girl-guide, studying for examinations, and giving but a very small percentage of her time to the cultivation of the emotions, these French children are breaking their hearts, or at least having experiences that vitally affect their mental and moral development. Francis Jammes deplores the artificial and restricted outlook that allows children to grow up so ignorant of the resources of the outer world, as well as of their own nature. He almost joins hands with the psycho-analysts in his appeal for truth and a free outlet for the natural instincts.

The popular opinion in England is that the French have only one theme in literature, just as they have only one joke—the theme and the joke being *sex*. Until quite recently the “yellow-back” stood as a symbol of the world, the flesh, and the devil; of late there has come a change, and every French publisher's list contains a fair proportion of titles marked “à mettre entre toutes les mains”—a fact which indicates, not an access of Puritanism, but a widening of the field of interest to include all the phenomena of human experience. The psychology of passion does still occupy a very important place. Henri de Régner, Marcelle Tinayre, Henri Bordeaux, continue to produce love-stories which are eagerly devoured by the French public. The Prix de la Vie Heureuse was awarded last year to M. André Corthis for his love-story *Pour Moi Seule* (*For Myself Alone*). In *L'Aventure de Thérèse Beauchamp* (*Thérèse Beauchamp's Adventure*), Francis de Miomandre has produced an original and striking variation of the theme known in France as *Elle, Lui et l'Autre*, and in England as “a triangle story.” André Gide, in *La Symphonie pastorale* (*The Pastoral Symphony*), has drawn a touching picture of the awakening of love in a young blind girl.

In ninety-nine out of a hundred of these books, love in its highest sense, as that which can only desire the well-being of the beloved, is conspicuously absent. Yet one or two of the younger French authors are beginning to discover something more in the relation of the sexes than the selfish desire for physical and mental enjoyment. The idea that the *mariage de convenance* is immoral is entirely novel, and it is left to a Catholic mystic, Francis Jammes, to propound it (*Roman du Lièvre*, p. 204). The fact that a revolution in the conventional attitude of the French towards marriage has even begun points to a spiritualising process, which can be seen in the numerous studies of religious psychology that are becoming increasingly popular in France. Such a book as Estaunié's *L'Empreinte* (*The*

Impress), anti-clerical, anti-Roman, is intensely religious in essence. Estaunié is seeking for reality beneath all the outward manifestations of faith and piety. His hero, a student at a theological seminary, is almost the counterpart of Ernest Renan in his early days at Saint Sulpice. There is the same natural zest for spiritual things, the same trust in the Church and the priests, the same shattering of that trust, and, alas! the same incapacity to remould the life that has had so powerful a seal set upon it as the Jesuit up-bringing. Renan consoled himself mentally by turning to scholarship, and spiritually by a vague Deism which left him the poetry of religion without its rational basis. Leonard in *L'Empreinte* is a deeper thinker, and believes that there is no alternative. Either the whole Catholic Faith or—nothing. Less courageous than Renan, he drifts back to the monastery, knowing full well that he is compromising and thus throwing away his last chance of finding truth.

Another young man, the hero of *L'Épreuve du Fils* (*The Proving of a Son*), is likewise on the quest for truth. He too is a seminary priest, and finds his ardent faith and hope fail him when he is sent out into the world on his first “cure.” But he learns in time the secret of his malady, which to some of us seems to be also at the bottom of Renan's and of Leonard's failure—God will not reveal Himself to those who want Him for themselves; only in giving can spiritual good be acquired.

The significant fact about these two books and others of the same kind is that the French are concerning themselves less with theological disputes and questions of outward form, than with the spiritual principles that are the basis of religious belief and practice. They are out not for realism, but for reality, and are approaching it from the side of orthodoxy as well as from that of dissent. The age of cynicism, represented by Anatole France, seems to be yielding to an age of faith—not necessarily religious faith, but faith in some ideal of human conduct, enthusiasm for some cause wider than the good of the individual.

That intense love which every Frenchman has for the land, the actual soil of France, is a subject which is very frequently treated in contemporary fiction. Guillaumin's *Vie d'un Simple* (*The Life of a Simple Man*), Pérochon's *Nêne*, and other novels are epics of the soil, showing the Frenchman at his best and as he is rarely seen by English eyes. These simple, God-fearing, hard-working farmers and landowners are as different from the Parisian dandy (so dear to second-rate novelists) as the London clubman, say, of Thackeray's novels is from our own country squires and yeomen. They are the true Frenchmen, and to that same type belong the boys who fight out their religious beliefs in the teeth of tyrannical opposition,

and also the boys and men who went so blithely to lay down their lives for France in the recent war.

Many of the younger generation of French writers were killed in action—Renan's grandson, Ernest Psichari, author of a very beautiful study of religious conversion; Charles Péguy, the mystic, around whom rallied the young Catholics of the intellectual and artistic world; Alain Fournier, whose *Grand Meaulnes* (*Big Meaulnes*) was awarded the Prix Goncourt, and is now widely read in British schools; all of these were stamped by that simple earnestness, love of beauty, and belief in righteousness, that seem to be the watchwords of the new era in France. They are gone, but others are taking their places, and if we would have something of the real France, we cannot do better than read the works of men like Marcel Proust, Henri Bachelin, Estaunié, Claudel, René Boylesve, and Georges Duhamel. They share our interests and our experiences, and it is for us they write. Whether they are geniuses or not, time alone can show. As Marcel Proust wisely remarks: "It takes us a very long time to recognise, in the particular physiognomy of a new author, that brand which is labelled 'great talent,' among our collection of general conceptions. Precisely because it is new, we feel it does not exactly correspond to what we call talent. We prefer to name it originality, charm, delicacy, force; and then one day we become aware that all those qualities are—talent." (*Du Côté de chez Swann*.)

READING LIST

ADVENTURE:

L'Atlantide (*Atlantis*), Pierre Benoit. (Albin-Michel, Paris, 6 fr. 75.)

Le Lac Salé (*Salt-Lake*), Pierre Benoit. (Albin-Michel, Paris, 6 fr. 75.)

PASTORAL:

Nève, Pérochon. (Plon-Nourrit, Paris, 6 fr. 75.)

Vie d'un Simple (*Life of a Simple Man*), Guillaumin. (Stock, Paris, 6 fr. 75.)

Le Serviteur (*The Servant*), Bachelin. (Flammarion, Paris, 5 fr.)

CHILDHOOD:

Mon Petit Trott (*My Little Trott*), Lichtenberger. (Plon-Nourrit, 5 fr. 95.)

¹ *Le Petit Pierre* (*Little Peter*), Anatole France. (Calmann Lévy, 6 fr. 75.)

La Mère et L'Enfant (*Mother and Child*), Charles-Louis Philippe. (Nouvelle Revue française, 5 fr. 75.)

² *Le Grand Meaulnes* (*Big Meaulnes*), Alain Fournier. (Emile-Paul, 6 fr. 75.)

³ *Jean Christophe* (vols. i and ii), Romain Rolland. (Ollendorff, 7 fr.)

¹ English translation published by John Lane.

² Annotated edition for schools published by the Oxford University Press.

³ *John Christopher*, published by William Heinemann, translated by Gilbert Cannan.

RELIGIOUS:

L'Empreinte (*The Impress*), Estaunié. (Perrin, 6 fr. 75.)

L'Épreuve du Fils (*The Proving of a Son*), Mayran. (Plon-Nourrit, 7 fr.)

La Colline inspirée (*The Hill of Inspiration*), Barrès. (Emile-Paul, 6 fr. 75.)

Pour moi Seule (*For Myself Alone*), Corthis. (Albin-Michel, 6 fr. 75.)

La Symphonie pastorale (*The Pastoral Symphony*), Gide. (Nouvelle Revue française, 4 fr.)

La Résurrection de la Chair (*The Resurrection of the Body*), Bordeaux. (Plon-Nourrit, 7 fr. 50.)

SPECIAL PSYCHOLOGY:

Dansons la Trompeuse (*Let us Dance "La Trompeuse"*), Escholier. (Grasset, 5 fr. 75.)

Confession de Minuit (*Midnight Confession*), Duhamel. (Mercure, 6 fr.)

Solitudes (*Solitude*), Estaunié. (Perrin, 6 fr.)

Du Côté de chez Swann (*Towards Swann's House*), Proust. (Nouvelle Revue française, 5 fr.)

Reviews of Books

Zoology for Medical Students. By J. GRAHAM KERR. 485 pp. (Macmillan & Co., 1921, 25s.)

Professor Kerr has added another to the long list of zoological textbooks. In spite of their number, it certainly cannot be said that there is no room for an addition to the list; probably most of those engaged in teaching elementary zoology find it difficult to recommend any book that seems adequate. But Professor Kerr's work cannot be judged solely as an attempt to produce a book that should supply a general want inasmuch as it is written with a particular syllabus in view—namely, that of Glasgow University. And this syllabus must be a remarkable one if "in a period of ten weeks" a student is supposed to cover the ground gone over in this book. There are nearly 500 pages of almost pure morphology, touching upon practically all the groups of the animal kingdom, while the illustrations are not very numerous. It may be remarked at once that the illustrations given are excellent.

The existence of this type of syllabus is not unknown in England, and, leaving aside for the moment the question as to how far this book is adequate for the syllabus, it may be suggested that this state of things is a misfortune for Zoology. Morphology is but one aspect of Zoology; there is the huge field of experimental zoology; there is ecology; there is the study of variation, inheritance, and evolution, even if physiology is altogether excluded. Surely it may be said that an elementary zoological course should deal with the elements of branches of Zoology other than the purely morphological. They can be so taught as to afford as good an intellectual discipline as morphology affords, and, further, knowledge of them is as essential to a medical student as is Morphology. The fact is that the teaching of elementary Zoology requires overhauling in our universities.

If, however, we ask how far Professor Kerr has suc-

ceeded in his task—that of writing not so much a textbook of elementary Zoology as a textbook of elementary Morphology—we must confess to a feeling of disappointment. Professor Kerr says that “one of the first endeavours of a teacher of Zoology should be to cast over the minds of his pupils some of the fascination of the most fascinating of sciences,” but it may be doubted whether this book will attract many students to its subject. There is a failure to knit the animal kingdom together, to direct attention to the different origins of analogous organs—of the body cavity, for instance—to follow the varying fates of homologous organs in different groups. It provides a clear description of the morphological details of nearly all groups, but it is a dry description rather in the nature of a general taxonomic account of the animal kingdom. There is no attempt to spare the student the learning of those innumerable technical terms which cumber zoological literature. Why should not the “branchiostegite” of the crayfish, for instance, be called just what it is, namely, the gill cover? The only remarkable feature of the book is the space devoted to parasites; a large amount of space under this heading is given which will be useful to medical students as it is not easily found elsewhere under one cover.

Turning to points in detail, it is unfortunate that the term “nephridial organs of Vertebrates” should be retained. The use of this phrase tends to obscure the essential fact that these organs are coelomoducts. The very definite statement on p. 295 (though qualified on the following page) about bony tissue in the dogfish is misleading.

A. M. C.-S.

An Introduction to the Theory of Relativity. By L. BOLTON. (Methuen & Co., Ltd., 5s.)

Relativity and Gravitation. Edited by J. MALCOLM BIRD. (Methuen & Co., Ltd., 8s. 6d.)

So many books of a popular nature have now appeared on the theory of relativity that surely the only outstanding difficulty of the subject must be that of finding suitable titles for them! These two books, however, are out of the ordinary. The first is by Mr. Bolton, the lucky man who won the prize of £1,000 offered by the *Scientific American* for the best account of the theory in less than three thousand and one words. It is an expansion of the winning essay to twelve times its length. The author has not hesitated to use a little elementary mathematics in the discussion.

The second contains Mr. Bolton's essay in its original form and selections from some of the essays which came near to winning the prize. The sub-editing and piecing together of these so as to describe important parts of the theory in detail has been done by an associate editor of the *Scientific American*, and done rather well. A list of those “honourably mentioned” is given. Two interesting questions arise. One is, “Why is it that the many distinguished Professors of Physics and Astronomy, who competed, allowed themselves to be beaten by one who holds no position at a University?” and the other, “Why is it that several, who are known to have competed

and yet who were not honourably mentioned, still persist in writing about the subject?”

A. S. R.

Among the Hill-folk of Algeria. By M. W. HILTON-SIMPSON, B.Sc., F.R.G.S., F.Z.S., F.R.A.I. (Fisher Unwin, Ltd. Illustrations and Map. 21s.)

The Berber tribes of Algeria have always held strong claims to a romantic interest as a fair-haired, blue-eyed, physically “European” type in an Oriental setting, and to an ethnological interest as a survival of the indigenous population of North Africa which has remained racially uncontaminated by the great Oriental invasion that flowed round and past their mountain strongholds seven centuries ago.

Their position is not unlike that of the Basques on the eastern slopes of the Pyrenees, that ancient race which was itself untouched by the Aryan tide, and some slight affinity of language has lent colour to the theory that both Basques and Berbers are survivors of the original inhabitants of the great European continent before the Straits of Gibraltar divided it from Africa, cutting off the Berbers, together with that other interesting survival, the Barbary stag, from their Northern relatives.

The interest is greatly enhanced by Captain Hilton-Simpson's discovery of many hitherto undescribed customs and beliefs in the Berber tribe that he studied. The present book is the firstfruits of three winters spent by the author and his wife among the hill-folk of the Aurès Mountains, only thirty miles from the tourist-town of Biskra, yet so remote in their cliff dwellings and almost inaccessible ravines that in many villages the female inhabitants had never seen a European woman.

The chief object of the expedition was to collect native implements and handiwork, and if possible to investigate the primitive native surgery and bring back specimens of the surgical instruments used. This promised to be a matter of considerable difficulty, for, as the unqualified practitioners are discouraged by the French officials and held answerable at law for their failures, their very extensive practice is carried out in secret; but the author, after gaining the confidence of the people by his interest in hunting and by generous dispensations from his medicine chest, was able to obtain first-hand evidence, finally even to be adopted as a pupil, and he was rewarded by being able to observe the medicine and surgery of Mediaeval Europe in actual application.

Trephining the skull seems to be the chief major operation (amputations being forbidden by the Mohammedan religion) and principally employed, rationally though sometimes unnecessarily, for the head injuries common enough in a turbulent race of mountaineers. There is no record that the operation is ever performed “to let out the evil spirit” as used to be done apparently in the South Sea Islands. The operation is carried out in several stages, for tough as the patients are, only a little drilling and sawing can be done each day till a disc of bone is free enough to be removed in one case with a screwdriver. Although neither anaesthetics nor antiseptics are used, a fair number of successful results seem to be obtained. Both

vegetable and mineral drugs are used, and the general practice is apparently derived, as was much of the Mediæval medicine of Europe, from the writings and tradition of the great Arab physicians of the schools of Cairo and Tunis.

Besides the regular medicine, magic and charms are much used, not by the native doctors but by professional sorcerers, important members of a community to whom malevolent spirits and the evil eye are an ever-present danger. Jinns and demons are kept at bay by the carrying of pungent and ill-smelling drugs, such as red pepper and assafetida, just as the latter and valerian used to be given in English medicine to drive out the evil spirit of hysteria by making his habitation intolerable. The practitioners of magic among the Shawia tribes evidently wield considerable powers of suggestion, for an eye-witness described in detail to the author the old witchcraft miracle of juggling the moon out of the sky into a bowl of water, though in this case for no greater purpose than to make a love-philtre.

The romantic character with which some writers have invested the Berbers is not substantiated by the author, but we get a picture of a typical, sturdy, superstitious, hospitable Highland people, playing the pipes, as all hill people seem to do from Scotland to the Himalayas, keen hunters and sportsmen (the national game is a furious kind of hockey, played with a juniper branch and a round stone); and in the late war they showed themselves to be as good fighters as they were in the days of the Romans, who found it more convenient to pay them to defend the Southern frontiers than to exact tribute from them as a conquered nation.

The book is well illustrated with photographs and contains a useful appendix of hints to travellers; and, if sometimes we are inclined to look for more explanation and discussion of unfamiliar customs from so experienced an ethnologist, these may be expected in a later and more technical volume in which the findings of the expedition will be collected and analysed. Meanwhile the present volume provides a popular and very entertaining account of a little-known people and, for those who will be stimulated to follow the author not in imagination only, a practical guide to their country.

F. A. H.

The Heart of Nature, or The Quest for Natural Beauty.

By SIR FRANCIS YOUNGHUSBAND, K.C.S.I., K.C.I.E.
(John Murray, 12s.)

It is difficult to know what kind of attitude to assume towards this book. We are on the whole inclined to consider it as the embodiment of a philosophy, formed by and during the life of a man of action, who for the purpose of its expression has deliberately thrown to the winds all knowledge of pre-existing philosophies and religions. Early on in his book Sir Francis Younghusband describes the delight that overcame him at discovering a great solitary lily starred with flowers in the Sikkim Forests, as "one of those experiences which most certainly make us younger," because, as he adds, "we are once again children

finding flowers in a wood." This last sentence seems to us to sum up the spirit of these pages. The great explorer has sought to recapture "those first fine careless raptures" of his youth and early manhood and to mould them with the experiences, but not the increasing critical faculties, of later life, into a philosophy. If this be the case we can understand why Sir Francis skates, through every page he has written, on the thinnest sheet of ice between him and the entangling waters of philosophy. To mention only two small passages, in the description of the poet as one who "works by spontaneous creativeness . . . is utterly original—a true creator," he comes perilously near to involving himself in the Platonic doctrine of innate ideas, and he approaches and dismisses with extremely flimsy arguments one of the most debated questions of Æsthetics, that "whatever adequately expresses a definite purpose is beautiful."

Coming to the core of the book, which could have been adequately developed in a quarter of the space used, we find that Sir Francis is an advocate of a sort of pantheism, somewhat on Shelleyan lines. He believes that the Spirit of Nature permeates everything, lives in everything, energises everything; that Nature is not merciless or hard, but that "in spite of the very evident struggle for existence *She* does not care twopence whether the 'fittest' survive or not so long as what is best in the end prevails"; that "Nature is a Person, and a Person is a process. . . . And actuating the whole process, determining the whole great event, is an inner core of Activity which endures through all the changes. . . . It is what we should mean when we speak of God." As William James pointed out in his *Varieties of Religious Experience*, the rock with which so many pantheists collide is the question of Evil, which their philosophy logically tends to ascribe as having its foundation in God. No very definite attention is paid to the existence of Evil by Sir Francis Younghusband. But the President of the Royal Geographical Society has done a fine thing in these days of materialism by urging on his readers the belief that Matter is not the "end-all and the be-all" of the Universe, but that there is Spirit actuating it everywhere.

To return to less important passages, the book is full of truly-felt and nobly-expressed sentiments, while there are vivid descriptions of the approach to, and first sight of, the Himalayas, of the vast, dark, luxuriant forest in the Teesta Valley, and the uplifting qualities of nights spent in deserts surmounted by starry skies.

E. L.

Modern English Drama: An Outline. By PATRICK KIRWAN. (National Home Reading Union, 1s.)

The writing of a literary or dramatic history of one's own times is beset with dangers. Any man, however aloof and neutral be his mind, is bound to be influenced to some extent by the consensus of contemporary opinion. We doubt if Mr. Kirwan's perspective is always quite a true one. He pays too much attention to the transient charms of Barrie, and to the fantasies of Dunsany, beautiful but too gossamer-like to be handed down as classics of

the dramatic art. On the other hand, we found no mention of Masfield's *Nan*—surely one of the greatest tragedies produced on the modern stage.

But admittedly we are influenced by contemporary opinions as much as Mr. Kirwan, and what critic can honestly say that he is in the right? We thoroughly agree with the selections of the other dramatists for special treatment made by Mr. Kirwan, who, besides the work of the two playwrights already mentioned, has most lucidly outlined *The Problem Play* (Sir Arthur Pinero), *The Stage Debate* (Bernard Shaw), *The Drama of Questions of the Day* (John Galsworthy), and the dramatic methods of some less important writers.

Within the thirty-two pages of his pamphlet the author has found space to lead up to his subject with a short, carefully proportioned account of the traditions of English drama, and to round it off with a study of recent foreign influences, and a useful bibliography.

E. L.

Books Received

(Books mentioned in this column may or may not be reviewed in this number, or in a later number.)

ANTHROPOLOGY AND ARCHÆOLOGY

The Witch-Cult in Western Europe. By MARGARET ALICE MURRAY. (Clarendon Press, Oxford, 16s.)

Studies in North Africa. By CYRIL FLETCHER GRANT. (Simpkin, Marshall, Hamilton, Kent & Co., Ltd., 8s. 6d.)

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DEAR SIR,

Before I left England nine months ago, I was highly interested in the recent advances in radio-activity and in the experiments revealing the nature of the atom and the construction of the elements.

Can you tell me how the work is progressing, and the names of any very recent books or periodicals dealing with these matters? I hate to bother you, but you are the only competent authority I know.

Yours, etc.,

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SCIENCE AND INDUSTRY

To the Editor of DISCOVERY

SIR,

The Editorial comments on that part of the speech of the President of the British Association which dealt with the relation of science to war cease at the point where they tend to become most fruitful. The more important question, surely, is the value of science to peace. Perhaps this is assumed. But is it not also a fact, to amend the quotation from Sir Edward Thorpe's speech, that an educated public will refuse to give credit to any body of scientific men who employ their talents in devising means to develop and perpetuate a mode of *existence* which is abhorrent to the higher instincts of humanity? The harnessing of solar energy in all its forms by men of science has given to civilised mankind a machine of enormous capability of production—and has at the same time dispossessed millions of the necessities of life.

The men of science are, of course, no more to blame for producing the horrors of peace than for creating the horrors of war, but it seems a pity that Sir Edward Thorpe did not fully develop his argument, and press for scientific men to employ their talents in devising means to develop and perpetuate a mode of *social organisation* which is acceptable to the highest instincts of humanity, and wherein science would enrich and not destroy the people.

Yours, etc.,

A. J. LILLIMAN.

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Hon. Sec. and Treasurer,
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ELECTRONS AND ETHER WAVES

To the Editor of DISCOVERY

DEAR SIR,

Is not the solution of the problem stated by Sir William Bragg in your September issue to be found in the nature of the medium? It is hard to conceive an incompressible, frictionless fluid, such as the Ether of Space, but if such exists, the analogy of the falling log of wood and the ship 1,000 miles away must require considerable modification. We must imagine that the surface of the sea is perfectly rigid, and that therefore none of the energy transmitted by the falling log can be dissipated in forming ripples or waves.

The sea being formed of an incompressible fluid, would not the energy be transmitted as an impulse to the loose timber in the vessel and, encountering a plank of the same weight as the original log, shoot it up to the same height, eliminating friction?

In other words, can there be actual waves in an incompressible fluid, or do not the waves form only when the impulse encounters matter?

Yours, etc.,

H. STANSBURY,
Captain R.N.

6, OAKMOUNT AVENUE,
SOUTHAMPTON.

October 9, 1921.

UNEMPLOYMENT

To the Editor of DISCOVERY

DEAR SIR,

Regarding Professor Knoop's interesting article on unemployment, there is one method of alleviating the distress which is seldom touched upon by writers; namely, the conversion of some of the employee class (either employed or unemployed) into master men by means of a State loan of capital (money, tools, or materials) in cases where the employee has the necessary good character and trade ability, but lacks the necessary funds.

There are many cases at present where unemployed men are working at home at their trade, but are only partially successful on account of the lack of capital necessary to make proper "master" men of them.

I suppose a State loan on the security of a man's personal character and skill, and at a low rate of interest, would practically mean a State Bank, and would interfere with the great banking interests of the country, and that, therefore, the idea is "scotched" by politicians. There is no doubt that many practical men of good character would be just as successful as men who often have no technical knowledge of the business they engage in, but who entered into it with capital which many men of the former class lack.

It does not seem a perfect system, from a scientific point of view, that the possession of capital should have such a great advantage over years of accumulated skill and knowledge.

I remain, yours, etc.,
GEO. McLAGGAN.

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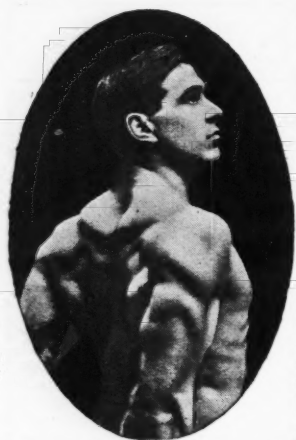
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